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MARCZYNZSKI (R.). **Studies on the nutrition of Collybia velutipes (Curt.) Quél. (Homobasidiomycetes, Agaricales).**—*Amer. Midl. Nat.*, xxx, 1, pp. 164–170, 1 graph, 1943.

In a study of the vitamin requirements of *Collybia velutipes*, a fungus causally related to heartwood decay in tree stumps and living trees, the strain used had been isolated from a sporophore from an elm stump in Indiana. The results showed that the addition of thiamin to the medium increased dry matter production by 400 per cent. Thiazole was as effective as thiamin, but pyrimidin was less active. Biotin was only slightly active at a small dosage (0·1 gamma per 26 ml. of medium), but highly effective at a large one (5 gammas per 26 ml. of medium). Pyridoxin and riboflavin were ineffective. Yeast and malt extract were more active in small quantities (5 mg. per 26 ml. of medium) than was a combination of thiamin, biotin, pyridoxin, and riboflavin. This indicates the presence in the extracts of some factor or factors other than the vitamins studied. Small amounts of bacto-agar increased the production of dry matter, possibly because of its physical properties.

LECLERG (E. L.), LOMBARD (P. M.), EDDINS (A. H.), COOK (H. T.), & CAMPBELL (J. C.). **Effect of different amounts of spindle tuber and leaf roll on yields of Irish Potatoes.**—*Amer. Potato J.*, xxi, 3, pp. 60–71, 3 figs., 1944.

Experiments conducted over a period of three to four years, between 1939 and 1942, in Alabama, Florida, Louisiana, Maine, Maryland, New Jersey, and Virginia, showed a general tendency for potato yields to decrease progressively as the amounts of either spindle tuber or leaf roll increased [*R.A.M.*, xxiii, p. 75]. The reduction in yield in the presence of 4 or even 8 per cent. spindle tuber (amounting on the average to 2·6 and 3·7 per cent., respectively), or 4 or 8 per cent. leaf roll (3·2 and 4·4 per cent.) was not usually significant from the point of view of commercial growing. It is pointed out, however, that under favourable conditions for current-season infection the market quality of a crop with 4 per cent. leaf roll can be severely affected by net necrosis in both the Green Mountain and Irish Cobbler varieties. The point of significant reduction in yield was found to be between 32 and 100 per cent. infection for either disease, although the effect on yield of either varied considerably in different seasons and for different varieties. In the presence of 100 per cent. spindle tuber, no significant difference in yield reduction was evident between Katahdin, Irish Cobbler, and Green Mountain, but it was significantly greater with both Katahdin and Triumph in Louisiana than it was in Maine during 1941 and 1942. The reduction in yield due to 100 per cent. leaf roll was, for Irish Cobbler, greater in Maine and Virginia during two years than in New Jersey, and for Katahdin greater in Florida and Maine during three years than in Louisiana. At the 100 per cent. disease level, leaf roll was more serious on Katahdin in Maine than was spindle tuber, whereas both diseases were equally detrimental to Irish Cobbler. Spindle tuber was more serious on Irish Cobbler in New Jersey and Virginia than was leaf roll, and the percentage reduction in

yield caused by leaf roll was significantly greater than that resulting from spindle tuber on Katahdin in Florida, Louisiana, and Maine from 1940 to 1942, inclusive.

Silberschmidt (K.), Kramer (M.), et Al. **A influencia da altitude sobre a degenerescencia da Batatinha no Estado de São Paulo.** [The influence of altitude on Potato degeneration in the State of São Paulo.]—*Rev. Agric. Piracicaba*, xviii, 1–2, pp. 1–108, 9 figs., 1943. [English summary. Abs. in *Exp. Sta. Rec.*, xc, 4, p. 490, 1944.]

Records were kept of the environmental conditions, yields, general state of health, and progressive development of virus diseases in seven consecutive 'generations' of the progenies of 300 healthy Eigenheimer potato tubers, one half of each of which was planted in a mountainous region (Cascata) of São Paulo, Brazil, and the other in the plains. Some of the offspring were transferred backwards and forwards between the mountains and the lowlands, while other lots were grown continuously under uniform conditions. Tuber lines returned to the mountains after temporary cultivation in the plains were found to have suffered a serious decline in fertility as compared with those grown continuously at a high elevation. Conversely, after one season in the mountains, tuber lines brought back to the low-lying regions yielded heavier crops in the next 'generation' than those that had remained in the plains, but the advantage was not maintained. Cultivation at a high altitude would thus appear to be beneficial for seed production purposes, especially in warm countries [*R.A.M.*, xix, p. 234].

Sardiña (J. R.). **La degeneración de las Patatas.** [Potato degeneration.]—*Agricultura, Madr.*, xiii, 142, pp. 83–87, 5 figs., 1944.

Brief descriptions, accompanied by a key, are given of the virus diseases affecting potatoes in Spain, namely, leaf roll (the most serious), 'mosaico superbenigno' (potato virus A), 'mosaica simple' or 'común' (potato virus X), and 'mosaico rugoso' [crinkle] (generally potato viruses A+X), together with directions for their control by the use of healthy, certified seed and field sanitation, involving roguing and tuber-indexing.

Benlloch (M.). **Enfermedades de las variedades importadas. La 'hipocnosis' o 'viruela' de la Patata.** [Diseases of imported varieties. 'Hypochnosis' or 'pox' of the Potato.]—*Agricultura, Madr.*, xiii, 2, pp. 78–82, 5 figs. (1 col.), 1944.

In 76 out of a large number of potato samples from different consignments examined between 1940 and 1943 at the Madrid Station of Phytopathology the presence of *Corticium vagum* (*Rhizoctonia solani*) [*C. solani*] was detected, distributed as follows among the imported varieties: Erdgold 19, Ackersegen 11, Flava, Wekaragis, Ostbote, and Ragis 6·002, 7 each, Konsuragis 5, Sabina 4, Merkur 2, and Ragis blanca, Ragis (?), Frühbote, Mittelfrühe, Condor, Akebia, and Royal Kidney (Finisterre), 1 each. In relation to the large volume of imports, the proportion of infection is very small, but there is a risk that the pathogen may be introduced by means of contaminated seed tubers into regions hitherto free from its ravages. For instance, outside Galicia, only one case is on record from the province of Palencia (1936), while in 1943 the writer detected the disease in the first-year progeny of Erdgold at La Cepeda, León. *R. violacea* [*Helicobasidium purpureum*], the imperfect stage of which closely resembles that of *C. solani*, is widespread on beet and lucerne in various parts of Spain. Directions are given for the control of *C. solani* by a rational system of cultivation and immersion of the tubers, before planting, in an acidulated mercuric chloride solution.

Other diseases of imported potatoes in 1942 included *Alternaria solani* on the Konsuragis variety at Montroig (Tarragona).

Schleusener. **Was lehren uns die Kartoffelkrankheiten des Jahres 1943?** [What do the Potato diseases of the year 1943 teach us?]—*Mitt. Landw., Berl.*, lix, 7, pp. 141–143, 1944.

The writer describes some of his experiences in connexion with the inspection of seed potato-producing establishments in East Prussia, where leaf roll was the most important of the virus diseases in 1943. There has been a growing tendency, for the last ten years or so, to concentrate on the viruses at the expense of other equally important groups of pathogens, notably the foot-rotting *Rhizoctonia* [*Corticium*] *solani*, which is promoted by the high temperatures prevailing in the storage house in the spring following mild winters such as those of 1942–3 and 1943–4. It is particularly important to maintain a cool atmosphere during the last two months before planting, so that the tubers do not lose their vigour through premature germination. One of the best methods of combating *C. solani* is to enrich the soil with green manure by the inclusion of lupins in the rotation, immediately preceding the potato crop.

Thurston (H. W.). **Recent tests of materials for Potato spraying in Pennsylvania.**—*Amer. Potato J.*, xxi, 3, pp. 55–59, 1944.

Among about 20 spray materials tested from 1941 to 1943 on the experimental farms of the Pennsylvania State College, all applied at the rate of 125 gals. per acre per application, only yellow cuprocide and tribasic copper sulphate [*R.A.M.*, xxiii, p. 74] gave potato yields not significantly lower than those obtained after spraying with Bordeaux mixture of comparable copper content. The copper 'A' compound (copper oxychloride) [loc. cit.] and the organic material HE 175 (disodium ethylene bisdithiocarbamate) showed some promise, but so far no material has been found better than Bordeaux. Reduced amounts of copper in spray formulas failed to give satisfactory control during severe outbreaks of late blight [*Phytophthora infestans*: loc. cit.] and led to significantly poorer yields.

Dillon Weston (W. A. R.) & Taylor (R. E.). **Blight.**—*J. Minist. Agric.*, li, 3, pp. 111–116, 1 fig., 1944.

In this practical discussion of the control of potato blight (*Phytophthora infestans*) with special reference to war conditions, the authors emphasize the danger of leaving diseased tubers lying about when the clamps are opened. When a clamp is opened, diseased tubers should be fed to pigs, burnt, or buried, and as soon as possible the clamp site should be ploughed, and a catch crop taken. Wherever possible seed should be boxed and periodically examined for the presence of blight. Earthing-up is important—a good ridge that reduces the risk of greening to a minimum also reduces blight. In industrial areas, spraying and dusting may do more harm than good, as interaction may occur between the material used and the acid fumes present in the atmosphere. Before undertaking spraying or dusting within twelve miles of a large industrial centre, expert advice on the advisability of treatment should always be obtained.

The severity of the disease annually from 1939 to 1943 is briefly noted. In 1940, wastage in clamped tubers in East Anglia consisted primarily of dry rot [*Fusarium caeruleum*], blight being found in clamps only in coastal areas of Lincolnshire. In 1941, wastage in tubers was heavy, especially round the Wash and in northern localities, where a 50 per cent. loss was commonly reported, but dry rot was not common. In 1942, wastage of tubers due to blight was conspicuously less than in 1941, averaging just over 3 per cent. in clamps in the eastern counties. The premature death of the haulm in 1942 accounts for the reduced tuber infection at lifting.

MARCHIONATTO (J. B.). **El 'manchado' do los granos de Arroz y los hongos que lo acompañan.** [The 'spotting' of Rice grains and the fungi that accompany it.]—*Rev. argent. Agron.*, x, 2, pp. 114–116, 1 pl., 1943. [English summary.]

The examination of rice grains bearing brown, chestnut-brown, dark, or whitish spots on the husks revealed the presence of various fungi, among which a species of *Alternaria* and a *Curvularia* placed by E. C. Tullis in close proximity to *C. pallescens* Boedijn [*R.A.M.*, xiii, p. 475] predominated, while others included species of *Helminthosporium*, *Epicoccum*, *Fusarium*, *Brachysporium*, and *Phoma*.

C. pallescens grows readily in pure culture on 1 per cent. potato dextrose agar, forming greenish colonies which spread outwards in a radial direction, the surface ultimately becoming covered by the cottony, appressed mycelium. The solitary, septate, prostrate conidiophores measure 110 to 130 by 3 to 4 μ, the hyaline, slender basal portion turning brown and increasing in diameter towards the slightly curved upper extremity, and give rise to acropleurogenous, ellipsoid, straight, geniculate conidia, 24 to 30 by 7 to 10 μ, consisting of four cells of irregular size and shape, the top and bottom hyaline and the middle ones greyish. Inoculation tests with spore suspensions of the fungus on sterilized Blue Rose rice grains in nutrient tubes at 18° to 22° C. resulted in the appearance, in 10 to 14 days, of brown, necrotic spots on the seedling roots, followed by cessation of growth and chlorosis and death of the leaves. Some of the infected grains failed to germinate, and on these were produced cylindrical, black sclerotia, $\frac{1}{2}$ to 1 by $\frac{1}{2}$ to $\frac{3}{4}$ mm., which did not develop on any of the culture media used but were subsequently observed in nature on non-viable, spotted grains. The sclerotia were attached at their bases to the teguments of the grain and consisted of polygonal, hyaline interior hyphae, while those of the exterior were greyish to dark, with irregularly papillate surfaces, and extended into sterile or fertile structures, the latter bearing conidia. The sclerotia of *C. pallescens* resemble those of *C. lunata*.

Negative results were given by inoculation tests with the *Alternaria* as regards actual pathogenicity to the seedlings, but there is reason to believe that it is concerned in a saprophytic capacity in the 'blanching' of the spikelets frequently following infection by *Piricularia oryzae*.

RYJKOFF (V. L.). Желтуха Кок-сагыза. [Kok-saghyz yellows.]—*C. R. Acad. Sci. U.R.S.S.*, N.S., xli, 2, pp. 94–96, 1 fig., 1943.

The author reports a new disease of kok-saghyz [*Taraxacum kok-saghyz*] in the Bashkir Republic and elsewhere in the U.S.S.R., which, pending further studies and inoculation experiments, he places in the 'yellows' group of virus diseases, as there is no evidence of any bacterial or fungal organism being involved. So far the disease has nowhere assumed significant proportions, but as it was found on a large number of hosts, namely, *Cirsium oleraceum*, chicory, *Chrysanthemum aureum*, *Sonchus oleraceus*, *T. officinale*, *Matricaria inodora*, *Valeriana officinalis*, *Aegopodium podagraria*, *Carum carvi*, *Plantago major*, and *Cynoglossum officinale*, the possibility of an epidemic outbreak must not be overlooked. The disease is considered to be potentially a serious threat to kok-saghyz, as it renders the plant entirely useless. The main symptoms are deformation and discoloration of the inflorescences, leaf chlorosis, and frequently stunting and a bushy habit of growth; in short, the entire complex typical of yellows. However, it differs from aster yellows in inducing more severe and frequent deformation of the inflorescences, and in not infecting some of the most typical of its hosts, such as *Callistephus*, *Lactuca*, *Lycopersicon*, and *Petunia*.

Society of Chemical Industry: Food Group (Microbiological Panel).—*Chem. & Indust., 1944*, 26, pp. 237–239, 1 diag., 1944.

At a London meeting of the Microbiological Panel of the Food Group, Society

of Chemical Industry, on 19th April, 1944, papers were read on different aspects of soil sterilization. W. F. Bewley ('Some problems in soil sterilization') stated that the first year's tomato crop on new land usually amounts to 50 tons or more per acre: ten years later the yield may have fallen to 35 tons, due to (*a*) the accumulation of insect pests and pathogenic micro-organisms in the soil, and (*b*) the condition known, in default of more precise information regarding its nature, as 'soil sickness'. Soil sterilization by means of heat or chemical agents is the remedy for both these pathological states. Steam sterilization is superior to the chemical process, freeing the soil from pathogens and restoring fertility in a remarkable degree.

One problem in the cultivation of plants in steamed soil is their tendency to rapid vegetative growth at the expense of the fruiting system. This effect is believed to be correlated with the extraordinary increase in the rate and extent of root growth in steam-sterilized soil, which may be restricted in pots or other containers. Another difficulty is the expense of the engineering operations involved in steam sterilization, the cost of which ranges in peace time from £180 to £200, and to-day from £250 to £300 per acre.

W. J. C. Lawrence, in his paper on 'Soil sterilization and seedling growth' drew attention to the formation in soil partially sterilized by heat of nitrogenous compounds, notably ammonia, sometimes in sufficient quantities to retard seed germination and seedling growth. Experiments at the John Innes Horticultural Institution in 1934, following a large-scale failure of crops on steamed soil, showed that tomatoes and most other plants used by the earlier research workers on steam sterilization were relatively tolerant of 'excess' ammonia. It was found possible to fix the bulk of the ammonia by the addition of superphosphate to the sterilized soil. An improved technique of high-pressure steam sterilization was also devised, and is now widely used, enabling the grower to sow seeds of all kinds at once, without waiting for the soil to 'recover'.

A. H. Dodd ('Considerations in chemical soil sterilization') referred to the use of a photo-electric instrument for the colorimetric determination of minute quantities of phenols in the soil. The method of administration of the higher boiling phenols in emulsion form is important. The globules of the emulsion are adsorbed to the soil particles and the degree of adsorption, which depends on the surface tension of the solution, is never sufficiently high, in the case of a 1 per cent. emulsion, to inhibit bacterial metabolism. This regulated surface adsorption is thought to be one of the factors in the control of fungal diseases, e.g., that caused by *Didymella* [*lycopersici*], by summer watering with diluted emulsions of higher boiling phenols.

Two papers by H. Lees and J. H. Quastel were respectively entitled 'A new technique for the study of soil sterilization' and 'Effect of chlorate administration on soil nitrification', the latter being followed by a discussion.

[An abstract of these papers also appears in *Nature, Lond.*, cliii, 3894, pp. 736–738, 1944.]

McClellan (W. D.). **A seedling blight of Castor Bean, Ricinus communis.**—*Phytopathology*, xxxiv, 2, pp. 223–229, 4 figs., 1944.

A species of *Alternaria* was consistently isolated from the cotyledonary leaves and young shoots of blighted Conner castor bean (*Ricinus communis*) seedlings in 1942 at the Plant Industry Station, Beltsville, Maryland, where the fungus was responsible for pre- and post-emergence damping-off and was likewise found to be present, in the mycelial stage, throughout the seed caruncles. The pathogenicity of the fungus was established by inoculation experiments on green, semi-ripe, and fully mature capsules, and on seedlings both in process of emergence from sterile quartz sand and at three weeks old, all of which gave positive results.

Large areas of the leaves of the early infected seedlings became water-soaked, flaccid, and covered with faintly zonate, dark brown, necrotic lesions, about ¼ in. in diameter, the lesions on those inoculated later being similar, but smaller and fewer.

Three species of *Macrosporium* previously described on the same host, viz., *M. ricini* from Japan and Korea [*R.A.M.*, ix, p. 610], *M. cavarae* from Italy [ibid., i, p. 304], and *M. compactum* Cke from Texas (*J. Linn. Soc. Lond.*, xvii, pp. 141–144, 1880), of which the two last-named are regarded as identical with the author's species, the name *A. compacta* (Cke) n. comb. being assigned to these three, while *M. ricini* continues to occupy a separate position. The spores of the writer's fungus are without elongate beaks, 14·0 to 38·5 by 7·0 to 19·5 (mean 21·4 by 10·8) μ.

Carvajal (F.) & Edgerton (C. W.). **The perfect stage of Colletotrichum falcatum.** —*Phytopathology*, xxxiv, 2, pp. 206–213, 5 figs., 1944.

The perithecial stage of a *Physalospora* has been found in profusion on dead and dying leaf blades, sheaths, and under sides of the midribs of sugar-cane, *Saccharum barberi*, *S. sinense*, *S. spontaneum*, *S. robustum*, and on the leaves of *Leptochloa filiformis* in Louisiana cane fields, generally following the production of *Colletotrichum falcatum* conidia [*R.A.M.*, xxii, p. 225]. Monoascospore cultures of the fungus produced an abundance of typical red-rot conidia, 357 of the 497 tubes yielding the dark strain and the remaining 140 the light-coloured one [ibid., xxi, p. 162]. Inoculation experiments on Co. 281 and C.P. 33/243 canes with conidia developing in monoascospore cultures resulted in the production of the characteristic red-rot symptoms, thereby fully establishing the genetic connexion between the two stages of the pathogen. The ascigerous phase of *C. falcatum* has been identified as *P. tucumanensis*, collected by Spegazzini in Argentina and described by him in *Rev. Fac. Agron., B. Aires*, ii, pp. 227–258, 1896. A technical diagnosis in English is given in the present paper.

The black perithecia of *P. tucumanensis*, 85 to 250 in height by 100 to 260 μ in width, are usually located between the fibrovascular bundles on the leaf sheaths and blades, often entirely filling the intervening space, nearly submerged with only the ostiole protruding. The clavate asci, 50 to 118 by 7·4 to 19·2 (mostly 70 to 90 by 13 to 18) μ, are thickened at the apex, and the unicellular, hyaline, straight to fusoid, elliptical to ovate ascospores measure 12·5 to 30 by 5 to 11·1 (18 to 22 by 7 to 8) μ. The very abundant paraphyses are usually unbranched and filled with granules or oil droplets. Ostiolar periphyses are abundant and conspicuous.

The perithecial stage was developed in the laboratory on sterilized cane, sorghum, and cane leaves and strips of filter paper inoculated with a culture of *C. falcatum* under humid conditions. *P. tucumanensis* was shown to be homothallic, perithecia being readily produced from single ascospore cultures. The eight ascospores from an ascus gave rise to identical cultures of equal pathogenicity.

Edgerton (C. W.) & Carvajal (F.). **Recent investigations on the red rot of Sugar Cane.**—*Sug. Bull., N.O.*, xxii, 4, pp. 26–29, 1943. [Abs. in *Sugar*, xxxix, 3, pp. 44–45, 1944.]

Although red rot of sugar-cane [*Colletotrichum falcatum*] has been recognized in Louisiana since 1908, knowledge of the life-history of the fungus, an important limiting factor in the sugar industry of the State, has been slow to accumulate. Up to 1942, the pathogen was known only in the conidial stage [see preceding abstract], but it has since been learnt that the spores may germinate on any part of the host, producing single-celled, thick-walled appressoria, which cause heavy infection when washed off the leaves on to the inner surface of the leaf sheath. Under ordinary field conditions, every leaf, leaf sheath, bud, root-band, and stalk

is covered with appressoria capable of originating an infection. Out of these observations arises the question of the hot-water treatment of seed cane, which would appear to hold some promise of success.

HICKMAN (C. J.). **Phycomycetes occurring in Great Britain. 1. Pythium mamillatum Meurs. 2. Pythium anandrum Drechsler. 3. Pythium aphanidermatum (Edson) Fitzpatrick.**—*Trans. Brit. mycol. Soc.*, xxvii, 1–2, pp. 49–51, 52–54, 63–67, 51 figs., 1944.

A strain of *Pythium mamillatum* isolated from diseased *Viola* roots in Britain [*R.A.M.*, xxiii, p. 343] formed, in water culture, sporangia, which, when terminal, were spherical to subspherical, and 16 to 25 (average 20·3) μ in diameter, and when intercalary were subspherical, subglobose, or somewhat piriform, and 18 to 44 by 16 to 18·9 (25·9 by 18·6) μ. They germinated readily, forming 10 to 15 reniform zoospores, which in the resting stage were spherical to subspherical and 8 to 10 μ in diameter.

The fungus grew well on maize extract agar, the colonies reaching a diameter of 90 mm. in about 50 hours at 30° C. Aerial mycelium was absent. Oospores appeared after four days. The oogonia were terminal or intercalary on lateral hyphae. The oogonial wall bore a variable number (occasionally only one) of short, straight or curved, blunt protuberances. The oogonia measured 12 to 20 (average 16·8)μ in diameter, or including the protuberances, 18 to 28 (22·9) μ. The antheridial stalk was sometimes strongly arched. The oogonia were completely or almost completely filled with smooth-walled, spherical oospores 12 to 20 (average 16·4) μ in diameter.

This strain corresponded closely with that obtained by Meurs from sugar beet seedlings [ibid., viii, p. 188]. Inoculation experiments indicated that the fungus was only slightly pathogenic to *Viola* roots.

From strawberries received from Scotland the author isolated (from pieces of root) *P. anandrum* [ibid., xviii, p. 651], apparently the first European record for this fungus. Asexual reproduction occurred sparingly. Large, irregularly oval or more elongated, non-papillate or papillate sporangia, 52 to 140 by 20 to 50 (average 91·4 by 39·2) μ, appeared in cultures on hemp seed in sterile distilled water, some extended distally in tubular fashion. Sporangial proliferation was occasionally noted. Some sporangia produced germ-tubes at one or both ends terminating in secondary sporangia. Sexual organs formed quickly and abundantly in maize extract agar and on mycelium growing from cultures on this medium in sterile Petri's solution. The terminal oogonia on short, stout, lateral branches bore numerous spines and measured 26 to 36 (33·8) μ in diameter including the spines. The oospores measured 14 to 22 (19·8) μ in diameter. The pathogenicity of this soil fungus to strawberry was not tested. There were no antheridia, the spherical oospores developing parthenogenetically.

In June, 1942, the author isolated from wilted, mature glasshouse cucumber plants a *Pythium* which he identifies provisionally as *P. aphanidermatum*. When pieces of infected stems were placed in sterile distilled water, sporangia developed which varied from slightly thickened but otherwise undifferentiated hyphal segments to irregular, sometimes branched, diversely lobulate elements. Lobulate sporangia were also produced on maize extract agar and in water culture from this medium. In these water cultures many sporangia were produced, and germinated readily, giving rise to numerous zoospores. Sexual organs appeared after five to six days in cultures on maize extract agar. The spherical oogonia were borne terminally, often on short lateral branches, and were fertilized by one, occasionally two, barrel-shaped intercalary or, occasionally, terminal antheridia. Sometimes, the antheridial hypha was distinctly seen arising from the same hypha as the oogonium. Each oogonium gave rise to a single, spherical oospore.

On maize extract agar the oogonia measured 24 to 32 (average 26·5) μ in diameter, and the oospores 20 to 28 (22·1) μ. On mycelium growing from maize extract agar cultures in sterile distilled water, the oogonia measured 20 to 30 (24·8) μ, and the oospores 16 to 24 (20·6) μ. The results of inoculations of young cucumber plants and fruits strongly suggested that the fungus was the primary cause of the disease.

Thirumalachar (M. J.), Swamy (B. G. L.), & Basheer Ahmed Khan (K.). **Contributions to the flora of Nandi Hills. Part I. Some interesting smuts and rusts.**—*J. Mysore Univ.*, N.S., Sect. B, iii, 2, pp. 195–204, 23 figs., 1943.

Included in this list of 20 smuts and rusts of the Nandi Hills are four new species [without Latin diagnoses] and one new combination. Mention may be made of *Puccinia purpurea*, *Sphacelotheca sorghi*, and *Sorosporium filiferum* on sorghum, *Uromyces hobsoni* on jasmine [*R.A.M.*, xx, p. 409], *Hemileia vastatrix* on coffee, *Hapalophragmium ponderosum*, producing large tumours anatomically similar to those of crown gall [*Bacterium tumefaciens*] on *Acacia leucophlaea*, and *Ustilago cynodontis* on *Cynodon dactylon*.

Krassilnikov (N. A.). Определитель лучистых грибков. **Actinomycetales.** [Classification of ray fungi. Actinomycetales.]—148 pp., 49 figs., Moscow-Leningrad, Acad. Sci. U.S.S.R., 1941. Roubles 9·50. [Received February, 1944.]

In an attempt to classify the Actinomycetales found, mainly in soil, in the U.S.S.R., on the basis of morphological characters, especially of the spores and sporophores, some general rules are laid down for the cultural studies of Actinomycetales. This monograph, which includes several new species [with diagnoses in Russian only] and new combinations, provides keys in Russian for the identification of species, and annotated descriptions of genera and species. The author recognizes two families: Actinomycetaceae [cf. *R.A.M.*, xxiii, p. 150], comprising 44 species and 3 subspecies of *Actinomyces*, 33 of *Proactinomyces*, 33 of *Mycobacterium*, and 10 of *Mycococcus*; and Micromonosporaceae, consisting of the single genus, *Micromonospora*, with 9 species. There is a bibliography of 263 titles.

Barghoorn (E. S.) & Linder (D. H.). **Marine fungi: their taxonomy and biology.** —*Farlowia*, i, 3, pp. 395–467, 7 pl., 4 graphs, 1944.

In this joint paper, D. H. Linder undertakes a classification of the fungi [*R.A.M.*, xxii, p. 327] collected on wood and cordage submerged in the sea off the United States coast. His list contains ten new genera, 21 new species, and two new combinations of Fungi Imperfecti and Pyrenomycetes. E. S. Barghoorn gives the results of a physiological study of seven of the species which were found to grow on media of varying salinity and in sea water three times the normal salinity, indicating that they are capable of an adaptation to, or tolerance of, the saline conditions in the sea. All the species studied, except *Amphisphaeria maritima*, grew best in media with an initial P_H above 7·6, and poorly or not at all in acid media. These results are again interpreted on grounds of physiological modifications in these fungi, which occur in adaptation to marine environment. Examination of their natural substrata, wood or rope partly or entirely submerged in salt or brackish tide waters, showed that the fungi penetrate and ramify in the cell walls of wood and cordage fibres, inducing decay by enzymatic hydrolysis of the cellulose and other constituents of the cell wall, in a manner comparable to that of terrestrial wood-destroying fungi. Laboratory experiments under controlled conditions demonstrated the ability of these 25 marine species to attack the various constituents of wood in culture.

Wollenweber (H. W.) & Hochapfel (H.). **Beiträge zur Kenntnis parasitärer und saprophytischer Pilze. V, 2. Diplodia und ihre Beziehung zur Fruchtfäule.** [Contributions to the knowledge of parasitic and saprophytic fungi. V, 2. *Diplodia* and its relation to fruit rot.]—*Arb. biol. Anst.* (*Reichsanst.*), *Berl.*, xxiii, 4, pp. 387–404, 5 figs., 1943.

The first part of the present study (*Z. Parasitenk.*, xii, pp. 165–250, 1941) dealt with eight species of *Diplodia* concerned in fruit-rotting, and in this further contribution the results of investigations on another four are fully described. They comprise *D. patellaris* (Wallr.) Mont. on elm (*Ulmus americana*) twigs from Michigan, originally described by Wallroth as *Sphaeria patellaris* from plum in Germany; *D. palmarum* (Cke) Wr n. comb. (syn. *Sphaeropsis palmarum* Cke) on unripe coco-nuts at Kifumangao, East Africa; *D. palmicola* (Fr.) Thüm. (*Sphaeria palmicola* Fr.) on grapefruit from the Banda Islands, Dutch East Indies; and *D. paradisiaca* (Mont.) Wr n. comb. (*Sphaeropsis paradisiaca* Mont.) [*R.A.M.*, xviii, p. 507] on black spots on the skin of an imported banana, unripe coco-nuts from East Africa, in the company of *D. palmarum*, a *Cassia sieberiana* stem from Sierra Leone, and a fig root from Brazil.

D. palmarum was the only one of these species that failed to attack apples (Pineapple Pippin) and quinces in inoculation experiments, though *D. patellaris* made very slow progress, requiring 28 days for the complete disorganization of the fruits at room temperature, while the corresponding period for *D. palmicola* and *D. paradisiaca* was less than a week. The two last-named species also infected lemons and oranges, *D. paradisiaca* being further pathogenic to bananas. *D. palmarum* is closely related, in respect of its spore dimensions, 19·1 by 9·6, mostly 17 to 22 by 7 to 13 μ, to various other species, e.g., *D. sarmentorum* (22 by 9·7 μ) and *D. palmicola* (12 to 28 by 7 to 15, mean 21 by 11·4 μ), but it differs from the former in its pycnidial characters and the longitudinal striation of the brown spores, and from the latter in the absence of pseudophysoids and of a reddish tinge in the mycelium, greater sensitiveness to high temperatures (no growth at 37° C.), and failure to cause rotting of pome fruits. Synonyms of *D. palmarum* are *Phoma palmarum* Sacc., *Macrophoma palmarum* Berl. & Vogl., *Botryodiplodia palmarum* (Cke) Petr. & Syd., and probably *D. sicula* Scalia.

D. palmicola, with which *D. epicocos* Cke (1877) and *D. cococarpa* Sacc. are regarded as synonymous, was one of the most active agents of rotting of apple, quince, lemon, and orange fruits, causing total decay of the last-named in wound inoculation experiments in a week and producing on the other hosts in the same time lesions 3 to 4 cm. in diameter. At the end of a fortnight all the fruits were rotten, the citrus fruit tissues being brown and those of the pomes black. Pycnidia with an abundance of brown, mostly uniseptate spores, 12 to 28 by 7 to 15 (21 by 11·4) μ, developed on the skins of all the fruits in a month. The spore dimensions of *D. palmicola* agree with those of *D. natalensis* Stevens, which is believed to represent the imperfect stage of *Physalospora rhodina* [ibid., vi, p. 127], and if this determination be correct, the species would also number among its hosts *Albizzia*, mango, and sweet potato in India and tea in Ceylon.

The average spore dimensions of the isolates of *D. paradisiaca* from the four above-mentioned hosts were 20 to 50 by 10 to 22 (28 by 14) μ, and therefore agree reasonably well with those of *B. theobromae* (27·25 by 14·2) μ and *D. natalensis* (24 by 15) μ, with which *M. vestita* and *D. cacaoicola* are regarded as synonyms. *D. radula* Berk. & Br. (Fungi of Ceylon, No. 785, 1875), the ellipsoid spores of which measure, according to Saccardo (Syll. Fung., iii, p. 371 [1884]), 25 μ in length, is probably another synonym. All four strains produced a pink to carmine aerial mycelium on malt extract, oatmeal, and Brown's starch agars and rice mash at 37°, while the colour of *D. palmicola* from citrus on the same media was similar

but rather duller. At a later stage olive-green to blackish tones developed in all four species. In contrast to these thermophile representatives of the genus, most of the other species tested, e.g., *D. palmarum*, *D. sarmentorum*, *D. pseudodiplodia*, and *D. mutila* made no growth at 37°, and at no point within their temperature range did a reddish coloration appear. The reddish tints of *D. paradisiaca* also developed more slowly, and on certain substrata only, at 18° to 23°. In inoculation experiments the strains of *D. paradisiaca* from banana, *C. sieberiana*, and coco-nut caused total spoilage of apple, quince, orange, lemon, and banana fruits in a fortnight, the banana isolate also being pathogenic to tomato, pear, and plum. The rotted quince and banana tissues were black and those of the other fruits brown. Some weeks later the mycelium and pycnidia ruptured the skins, which in the case of the citrus fruits was covered with a verrucose to tomentose coating and nodules up to the size of a pea (botryoid pycnidial nodules). The relatively few tests carried out with the fig isolate of *D. paradisiaca* on apple fruits, cut leaves and unripe banana (*Musa discolor*) fruits, and edible fig leaves showed it to be equally destructive with the other strains under investigation.

The ellipsoid-ovate or fusiform to subcylindrical, finely punctuate, mostly uniseptate spores of *D. patellaris* measure 16 to 40 by 9 to 22, mostly 23 to 32 by 10 to 14 (25 by 12) μ. They are hyaline at first but turning yellow to brown while still attached to the sporophores. Revised descriptions of each of the four species studied are given.

WILTSHIRE (S. P.). **Presidential address. The organization of the study of systematic mycology.**—*Trans. Brit. mycol. Soc.*, xxvii, 1–2, pp. 1–12, 1944.

Discussing in broad outline the nature of the problem that confronts the systematic mycologist with the existence of 37,500 'good' species and about 100,000 names, the author suggests a number of practical ways of dealing with this very difficult position. These, briefly summarized, are: the issue of a complete list of all species described, reduced to a minimum by the continual elimination of doubtful species; of lists of obligate and recently established facultative synonyms, with reference to critical opinions; of a catalogue of the classical mycological herbaria, showing their location, or a catalogue of type collections; the establishment of a clear procedure to be followed in the absence of types; a well-indexed literature capable of being kept up to date; and finally, a loose-leaf flora recording the salient features of known species. Regarding types of microfungi, it is pointed out that an author rarely specifies one particular preparation or plant part as the type and almost uniformly, therefore, any portion of a type collection has equal value wherever it may be deposited, provided it carries the fungus recognized as that originally described.

BOND (T. E. T.). **The 'phloem necrosis' virus disease of Tea in Ceylon. I. Introductory account, symptoms, and transmission by grafting.**—*Ann. appl. Biol.*, xxxi, 1, pp. 40–47, 2 pl., 1944.

This is a full account of the history, distribution, and symptomatology of phloem necrosis of tea in Ceylon [*R.A.M.*, xxii, p. 43]. The virus causing the disease is stated to be systemic, but a masking of its effects may occur to an unusual degree. From 1940 to 1942 the virus was transmitted by grafting (chiefly root-grafting) to nine clones, of Formosa, Java, and Ceylon origin. These belong in the main to the 'low-jat' type, while some of the commercially favoured 'high jats' proved to be carriers, showing no reaction to the virus itself, but capable of transmitting it to further susceptible scions. The problem of the control of the disease is discussed, but no definite measures recommended pending further investigations. The causal virus is believed to belong to the 'yellows' group, and is referred to as *Camellia* virus 1, following K. M. Smith's classification.

Diachun (S.), Valleau (W. D.). & Johnson (E. M.). **Invasion of water-soaked Tobacco leaves by bacteria, solutions, and Tobacco mosaic virus.**—*Phytopathology*, xxxiv, 2, pp. 250–253, 1944.

Non-motile bacteria, represented by *Staphylococcus aureus*, tobacco mosaic virus, inanimate particles (India ink), and solutions of certain toxic chemicals, viz., 1 in 1,000 mercuric chloride, 1 in 100 copper sulphate, and 3 3 50 Bordeaux mixture, were experimentally shown to be capable of entering water-soaked tobacco leaves. In tests with *Bacterium angulatum* [*Pseudomonas angulata*] on water-soaked and untreated leaves, the numbers of colonies developing on agar plates prepared from tissues of the former samples inoculated by pouring suspensions of 1 to 10, 1 to 100, and 1 to 1,000 on the leaves were 2,000 to 10,000, 2,000 to 5,000, and 150 to 800, respectively, as against none in cultures from the non-water-soaked controls [*R.A.M.*, xxi, p. 431]. The figures in comparable tests with *S. aureus* were 5,000 to 20,000, 1,000 to 3,000, and 20 to 100, the controls again yielding none. It is concluded from these results that motility is not an essential qualification for the foliar invasion of tobacco by leaf-spotting bacteria. The fact that chemicals can enter and injure water-soaked tissue further suggests the possibility that spray injury may be promoted by naturally induced water-soaking.

Costa (A. S.). **Quantitative studies with carborundum and its use in local-lesion tests.**—*Phytopathology*, xxxiv, 3, pp. 288–300, 1 fig., 2 graphs, 1944.

The number of local lesions induced by the tobacco mosaic virus on *Nicotiana tabacum* × *N. glutinosa*, *N. glutinosa*, and Early Golden Cluster beans was greatly increased by the use of carborundum (silicon carbide) as an abrasive [*R.A.M.*, xv, p. 737 et passim], and similar observations were made in inoculation experiments with the tobacco etch virus on *Physalis peruviana* and that of cucumber mosaic on Black cowpeas. In the case of the last-named, the abrasive permits the estimation of virus concentration in samples that could not be measured otherwise. The use of 0·1 M neutral phosphate buffer as a diluent for the cucumber mosaic virus likewise increased the number of lesions in comparison with distilled water. The action of carborundum is confined to the host, samples of the virus to which it was added behaving in the same way as the controls. In tests with the tobacco mosaic virus on *N. tabacum* × *N. glutinosa*, comparable results were given by three methods of applying the abrasive, viz., dusting, sprinkling, and adding to the juice. Of the five grades of carborundum tested, from 280- to 600-mesh, 500-mesh was the most effective, while almost as large an increase in the number of lesions on *N. glutinosa* was secured with 280-mesh aloxite (aluminium oxide).

Smith (K. M.) & Markham (R.). **Two new viruses affecting Tobacco and other plants.**—*Phytopathology*, xxxiv, 3, pp. 324–329, 2 figs., 1944.

Two new viruses are described, one first observed on an *Arabis hirsuta* plant and the other on White Burley tobacco. Though probably of little economic importance, they are of considerable interest as having unaccountably appeared (the one on *A. hirsuta* in mid-winter) on plants growing inside insect-proof glasshouses at the Plant Virus Research Station, Cambridge, England. Both viruses induce ring-spot symptoms on tobacco, but that from *A. hirsuta* is easily distinguishable by the characteristic curling and shredding of the central leaves of diseased plants. Evidence is adduced to show that the *A. hirsuta* virus, designated *Arabis* mosaic, differs from either cabbage or cucumber mosaic, with which there were reasons for connecting it. *Arabis* mosaic virus is inactivated by a ten-minute exposure to a temperature of 60° C. but not to one of 50°. In crude sap expressed from infected tobacco plants, the virus is infective at a dilution of 1 in 100, but not at 1 in 1,000. Its longevity in *vitro* at room temperature ranges from 48 to

72 hours. The virus is transmissible by means of the sap, but is not highly infectious, some difficulty being encountered in inoculation experiments during hot weather, when the symptoms are masked. Besides *A. hirsuta* and tobacco, *Nicotiana glutinosa*, *Solanum nodiflorum*, cucumber, and Canadian Wonder French beans were successfully inoculated with *Arabis* mosaic; in the case of *S. nodiflorum*, however, infection did not become systemic.

Tobacco broken ring-spot virus, so-called because of the frequent incompleteness of the rings, resembles *Arabis* mosaic in its thermal activation and dilution end-point relations, but it is longer-lived (six days at room temperature), and more readily transmissible through the sap. White Burley and Kawala Turkish tobacco, *N. glutinosa*, French beans, and cucumber contracted the broken-ring spot in inoculation tests, the symptoms as *N. glutinosa* being mild and transient. French beans and cucumber were particularly useful in the differentiation of the symptoms caused by the two viruses.

Thomas (H. R.). **'Freckle', a spotting of Tomato fruits.**—*Phytopathology*, xxxiv, 3, pp. 341–344, 1 fig., 1944.

Alternaria solani and a species referred by C. Drechsler to *A. tenuis* have been isolated from the dark, necrotic, yellow-bordered spots, $\frac{1}{8}$ in. or less in diameter, commonly observed in Indiana on ripe canning tomatoes and known locally as 'freckle', the side of the fruits directly exposed to the sun being usually more densely covered with the blemishes. Plants from segregating generations of *Lycopersicon esculentum* × *L. pimpinellifolium* appear to be particularly susceptible to the disorder, which is of little economic importance. In 1942, inoculation experiments were carried out on tomatoes at varying stages of maturity by atomization with aqueous suspensions of the two fungi concerned, which resulted in the production on the green-mature fruits by *A. tenuis* of typical 'freckle' spots, and on green ones by *A. solani* of the small, raised, jet-black lesions characteristic of late infection by this species. Probably only those infections of *A. solani* occurring on the green-mature and ripe fruit are typical of 'freckle'.

The examination of stained epidermal strips from affected tomatoes disclosed the presence of mycelium in many of the spots, which were commonly situated below superficial cracks, especially at the bases of broken hairs. The cells in the 'freckled' areas for three or four subepidermal layers were brown and occupied by brown masses staining deeply with safranin, oil globules, and crystals. Most of the discoloured cells below the epidermal layer were collapsed. Cell distortion and discoloration apparently occur in advance of the pathogens.

It is suggested that the predominance of infection on the side of the fruits exposed to the sun may be due to a heavier deposit of an air-borne inoculum rather than to the direct effect of the sun's rays, attempts to reproduce the symptoms by means of ultra-violet and infra-red rays having failed. The increased incidence of the trouble late in the season may be explained by the heavier spore load present in the air at that time, combined with the protracted exposure of the fruits.

Gottlieb (D.). **The production of healthy shoots by wilted Tomato plants.**—*Phytopathology*, xxxiv, 3, pp. 353–354, 1 fig., 1944.

A few Bonny Best tomato plants among hundreds inoculated with *Fusarium bulbigenum* var. *lycopersici* under optimum greenhouse conditions at the Minnesota Agricultural Experiment Station [*R.A.M.*, xxiii, pp. 194, 244], though wilted themselves, produced entirely normal new shoots from the meristematic regions near the stem base. These branches, from which the pathogen was rarely isolated, flowered and even set fruit. Histological examination revealed the presence of the fungus in the vessels of all parts of the main stem, but it was exceedingly

difficult to find in the new shoots; the development of healthy new growth in such close proximity to the diseased crown and roots is remarkable.

Costa (A. S.) & Forster (R.). **Lista de hospedeiras do virus de vira-cabeça.** [List of hosts of the spotted wilt virus.] —*Bragantia, S. Paulo*, ii, 3, pp. 83–91, 1942. [English summary. Abs. in *Exp. Sta. Rec.*, xc, 4, p. 487, 1944.]

Of the 45 plants tested for their reaction to the tomato spotted wilt virus in São Paulo, Brazil [*R.A.M.*, xxi, p. 354], *Nicotiana paniculata* proved to be the best adapted to the study of local lesions.

Sarasola (A. A.). **Dos septoriosis de las Alamedas argentinas.** [Two septorioses of Argentine Poplar groves.]—*Rev. argent. Agron.*, xi, 1, pp. 20–43, 3 pl., 11 figs., 1 graph, 1944.

A comprehensive account is given of the author's studies on two diseases affecting poplars in Argentina, namely, the canker caused by *Septoria musiva* [*R.A.M.*, xx, p. 386; xxi, p. 544], observed for the first time in the country in 1941 on two-year-old trees of the 'variety' Alemán No. 7 or 'De Virginia' on the Paraná Delta Experimental Farm, and the leaf spot due to *S. populi* [ibid., xxi, p. 99], recognized since 1933. The former species has also been encountered in two other localities of the province of Buenos Aires and the latter in the Paraná Delta and near the city of Buenos Aires. To the already numerous hosts of *S. musiva* within the genus *Populus* may be added *P. laurifolia* and *P. przewalskii*, besides many 'varieties' of obscure ancestry, including 'Arnaldo Mussolini'.

S. musiva occurs in two forms, namely, as a leaf spot causing premature defoliation and as a destructive branch and stem canker which had assumed an exceptionally grave character by the autumn of 1943. The foliar lesions induced by *S. musiva* on the leaves of the lower branches and those nearest the main stem (the first and most severely attacked) are necrotic, brownish-red or dark brown, of a mottled appearance, angular, and more or less delimited by the veins. On the leaves of more coriaceous texture they are circular to angular, often resembling an eye, with a greyish centre and a darker border, the whole surrounded by a yellowish, sometimes slightly raised zone. The paler spots on the under side bear the globose or slightly depressed, thin-walled pycnidia of the fungus, which measure (in 103 collections from different hosts) 49 to 206 by 37 to 205 (mean 98·8 by 113·7) μ, and give rise to cylindrical or vermiform, hyaline, straight or curved, 0- to 4-septate spores, 18·5 to 70·0 by 2·0 to 4·9 (43·4 by 3·2) μ (average of 1,200), discharged in the form of pink cirrhi under humid conditions. Spherical spermogonia, 32·9 to 94·7 by 28·8 to 86·3 (59·6 by 52·5) μ, were detected in profusion on both sides of the fallen leaves on the ground, their centres being occupied by handle-shaped, unicellular, hyaline spermatia, 4·1 to 6·1 by 1·0 to 2·0 (4·8 by 1·4) μ. Studies on the development of the perfect stage of *S. musiva*, *Mycosphaerella populorum*, which has been observed in the United States, are in progress.

S. populi forms two types of spots on the Lombardy poplar (*P. nigra* var. *italica*), so far apparently its only host in Argentina, one circular, 3 or up to 6 mm. in diameter, and the other angular, following the principal veins and usually coalescing into a more extensive necrotic zone; both are white or pale chestnut in the centre, darkening towards the edge and surrounded by a narrow, dark, slightly raised margin. There is a superficial resemblance between these lesions and the irregular white to ashen spots with darker centres produced by *Sphaceloma populi* [ibid., xvii, p. 83], which are, however, covered with prominent, black pycnidia and are also found on the veins and petioles. The pycnidia of *Septoria populi* vary in form from the characteristic *Phleospora* type with an incomplete aperture to concave and flask-shaped with a narrow ostiole and sometimes a rudimentary beak, while under humid conditions they are commonly convex, spherical,

and of a paler colour; the dimensions range from 82·4 to 206·0 by 74·1 to 206·0 (133·9 by 109·5) μ. The pycnospores are fusoid to falcate, hyaline, predominantly (91 per cent.) uniseptate, 6 and 3 per cent. being continuous and biseptate, respectively, and measure 22·6 to 49·4 by 3·0 to 4·1 (34·4 by 3·4) μ. *M. populi* has been recorded as the perfect stage of this parasite.

Cultural studies on both fungi were made on various standard media, of which rolled oats and cherry agars proved to be the most suitable. The formation of germinable chlamydospores in culture raises the question of their probable occurrence under natural conditions. The pycno- and chlamydospores of both species germinated at 21°, 24°, and 27° C. without appreciable differences between the three temperatures in respect of the resultant mycelium.

The possibilities of control, notably by the cultivation of resistant varieties, are under consideration.

Minz (G.). **Bees gather rust spores of Melampsora populina Kleb.**—*Hassadeh*, xxii, 6, p. 173, 1942. [Hebrew.]

Leaf rust (*Melampsora* [*larici-*] *populina*) [*R.A.M.*, xxi, p. 173] on poplar (*Populus nigra*) usually occurs in Palestine from October to November, but sometimes earlier. The rust pustules protrude from the leaf and are filled with yellow spores resembling pollen: when the rust appears, the bees come in large numbers to gather the spores. This was first observed in October to November, 1940. In 1941 rust appeared in the latter half of August. The bees gathered the spores up to the beginning of September and then disappeared. At the beginning of October the bees appeared again and thus announced a second rust attack. The use made by the bees of the spores is not known, but a glass beehive near the poplars would enable observations to be made on the point.

Tehon (L. R.). **Diseases of trees. Gleanings from the latest reports of scientific research.**—*Amer. Nurserym.*, lxxvii, 7, pp. 18–19; 9, pp. 24–25; 11, p. 18, 1943.

Since its discovery at Tryon, North Carolina, in 1935, mimosa [*Albizzia julibrissin*] wilt [*Fusarium perniciosum*: *R.A.M.*, xx, p. 612] has been reported from 55 localities along the South Atlantic coast, its range now extending from Richmond, Virginia, southwards to La Grange, Georgia, and inland from Norfolk, Virginia, and Bishopsville, South Carolina, both on the coastal plain, to Biltmore, North Carolina, in the mountains. In 1935 the number of mimosa trees at Tryon with trunks 4 in. or more in diameter was about 600, while the corresponding figures for 1938 and 1940 were 174 and 45, respectively. So destructive is this widely distributed disease that G. H. Hepting and E. R. Toole, of the Federal Division of Forest Pathology, rank it as a major problem among shade tree disorders. In addition to information already presented on the results of inoculation experiments with the fungus, *A. kalkora*, a white-flowered species, is stated to be highly susceptible, while the recently introduced Far Eastern *A. theoreli* is immune. *F. perniciosum* is capable of persisting for months in various types of soil, infected particles of which can easily be transported over short distances by rain and over longer stretches of country by streams and rivers, while it is not improbable that the fungus is also conveyed from infested to healthy areas on motor-car tyres or fenders. Direct control measures, such as spraying and soil sterilization, being ineffectual or impracticable, attempts are in progress to combat the disease by the development of resistant types of mimosa. The 508 seedlings raised from the seed of trees giving some promise of resistance were heavily inoculated through two growing seasons, by the end of the second of which there were only 31 survivors. Further tests on the latter are planned to guarantee the permanence of their resistance.

The investigations of D. E. Stuntz and C. E. Seliskar on the stem canker

(*Phytophthora cactorum*) of *Cornus nuttallii* and *Arbutus menziesii* in Washington [ibid., xxii, p. 458] are summarized.

Persimmon wilt [*Cephalosporium* sp.] has been shown by B. S. Crandall's surveys of mapped strips covering 500 miles of highways in Florida and South Carolina in 1942 [ibid., xxii, p. 489] to be maintaining, and in some regions extending, its existing territory. Thus, in a strip 28 miles long in Orangeburg County, South Carolina, there were seven wilt areas in 1942 as against one diseased tree in 1938, while in Wakula County, Florida, the number of infection foci had increased during the four-year period from 6 to 13. In north-central Florida and South Carolina the total number of wilt areas in 1938 and 1942 were 47 and 11, respectively, while by 1942 the corresponding figures were 61 and 18, respectively: in west Florida, on the other hand, where the host is scarce, there was a decrease during the period of observation from 42 to 23. The prosecution of field work on persimmon wilt is so greatly hampered by war conditions that a general appeal has been issued for reports on the suspected occurrence of the disease to be sent to B. S. Crandall, Division of Forest Pathology, United States Department of Agriculture, Athens, Georgia.

Kelley (A. P.). **The present status of American Chestnut in south eastern Pennsylvania.**—11 pp., The Landenberg Laboratory, Landenberg, Pennsylvania. U.S.A., 1944. [Mimeographed.]

After briefly reviewing the early history of chestnut blight (*Endothia parasitica*) [*R.A.M.*, xxiii, p. 282] in the United States and the threat the disease constitutes to the sweet edible chestnut (*Castanea dentata*) the author records observations made on plots since 1924, some of which have already been noticed [ibid., xix, p. 443].

One plot, visited in December, 1943, demonstrated that survival of the American chestnut cannot take place through sprouts from old stumps, whereas another which had escaped serious injury, showed several saplings with very little blight. In 1939, a six-acre tract of woodland where chestnut was still plentiful was set aside for experimental purposes, and in 1943 there were 115 healthy seedlings, 27 healthy sprouts, and 7 'blight-infected'. The author concludes that the chestnut is far from extinct and that the prospect of stamping out blight is better to-day than it has been at any time in the last 40 years. If crews of men could be employed to collect and burn the comparatively small amount of spore-bearing material present in the woods, it is thought that the seedling chestnuts would grow up unaffected. A single 'clean-up' would have to be checked several times for overlooked and later infections, but the task, though difficult, is not considered insurmountable.

Zentmyer (G. A.). **Vascular chemotherapy.**—*Trees*, vi 1, pp. 7, 16-17, 2 figs., 1 diag., 1943.

Following recent advances in science chemotherapy has been recognized as a highly promising approach to plant disease problems, in particular to the control of vascular diseases, involving as it does the introduction of chemicals directly into the sap stream where the vascular fungi develop. Investigations on these lines of the Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, xxiii, p. 156] and some vascular diseases of vegetable crops, have been conducted during the past two or three years at the Connecticut Agricultural Experiment Station. The research was based on one of the most plausible recent theories in medical chemotherapy, according to which sulphanilamide and similar drugs are effective against bacteria because of the structural resemblance of their molecules to those of certain vitamins required by the bacteria. On account of this resemblance the bacteria are believed to 'mistake' the chemical for the similar vitamin. As it has been recently discovered that vitamin B6 (pyridoxin) [cf. ibid., xxii, pp. 218, 323] is

essential for the normal development of *C. ulmi*, the problem was to find a chemical that the fungus could 'mistake' for this or other vitamins it requires. In the laboratory, several chemicals were found to inhibit the growth of *C. ulmi* in culture. In field treatment, however, no effective control has as yet been achieved, although significant reductions in the severity of disease were obtained by injecting various organic chemicals into small elm trees infected with *C. ulmi*, maples suffering from a *Verticillium*, and eggplants affected with *V.* wilt.

Lohwag (K.). **Der Buchenschwamm im Prater.** [The Beech fungus in the Prater.] —*Zbl. ges. Forstw.*, lxix, 2, pp. 54–58, 3 figs., 1943.

During the last 15 years the writer has observed many cases of infection by wood-destroying Polyporaceae among hardwoods in the Prater Park, Vienna. Thus, *Polyporus sulfureus* causes a red rot of willows [*Salix* spp.] and alders are occasionally attacked by *Phellinus* [*Polyporus*] *torulosus* and *Ganoderma applanatum*, but the most serious depredations are due to the beech or tinder fungus (*Ungulina fomentaria*) [*Fomes fomentarius*], the chief host of which in the Prater is the horse-chestnut. Infection is believed to date from the war period of 1914–18, and the resultant white rot is steadily spreading in a wide radius from the original foci, while old diseased trees lose large branches, covered with the pale grey fruit bodies of the fungus, in every storm. In a few cases of restricted local infection it may be possible to save valuable trees by the excision and burning of the diseased material and protective treatment of the cut surfaces, but in general these costly operations will only retard the course of the decay, so that the more radical measure of prompt felling is preferable.

P. squamosus is the most destructive tree parasite in the majority of Viennese parks, and the outbreaks of *F. fomentarius* will in all probability pave the way for its entrance into the Prater. Neither fungus is fastidious in its choice of hosts; mycelial development appears to be somewhat more rapid in *F. fomentarius*.

Hausam (W.) & Kuntara (W.). **Mikrobiologische Untersuchungen an Fichtenrinden.** [Microbiological studies on Spruce bark.]—*Collegium, Haltingen, 1943*, pp. 130–139, 1943. [Abs. in *Chem. Zbl.*, cxv (i), 6, p. 406, 1944.]

From varicoloured deposits and brownish-red stains on spruce bark bacteria, yeasts, moulds, and wood-inhabiting fungi were isolated, most of which induced similar stains on spruce bark agar and changes in the tannin, and more especially the non-tannins (sugars) in spruce bark emulsions, coupled with an increase in insoluble constituents. Pentachlorphenol, raschit [*R.A.M.*, xix, p. 318], and trichlorphenol in appropriate concentrations inhibited the growth of these organisms on spruce bark, with the exception of *Ophiostoma* [or *Ceratostomella*] *piceae*, to which the fungicidal observations do not apply, since it did not develop at all under the experimental conditions.

Ulbrich (E.). **Über einige Ophiostoma-Arten und die Blaufäule der Nadelhölzer.** [On some *Ophiostoma* species and the blue rot of conifers.]—*Notizbl. bot. Gart. Berl.*, xv, pp. 303–311, 1941. [Abs. in *Zbl. Bakt.*, Abt. 2, cvi, 11–12, pp. 230–231, 1944.]

The conceptions of 'blue stain' and 'blue rot' are defined and differentiated. The former is caused by species of *Ophiostoma* or *Ceratostomella*, which do not in the first place impair the durability of the wood: if, however, the latter is insufficiently dried before manufacture, the long-lived, black mycelia of the fungi may reappear and spoil the paint of window-frames, doors, and the like. The term 'blue rot' should be applied only to the sapwood parasites, especially *Stereum* spp. and *Polystictus abietinus*, which frequently accompany or follow the staining fungi and are responsible for true decay.

Ulbrich (E.). **Wachstumsbeobachtungen an Fruchtkörpern einiger Polyporaceen und Boletaceen.** [Observations on fruit body growth in some Polyporaceae and Boletaceae.] *Notizbl. bot. Gart. Berl.*, xv, pp. 258–278, 1940. [Abs. in *Zbl. Bakt.*, Abt. 2, xcvi, 11–12, p. 216, 1944.]

Daily measurements were made of the growth of the fruit bodies of two Polyporaceae, *Ganoderma lucidum* and *Polyporus squamosus*, and two Boletaceae, *Boletus edulis* and *B. luridus*. In all four species the cap began to expand only when the longitudinal growth of the stalk ceased, after which development proceeded at a uniform rate day and night. The fructifications of *G. lucidum* survived about 100 days, with two sporulation periods of up to a week. *P. squamosus* grew more rapidly and was shorter-lived, with only one period of spore dispersal [*R.A.M.*, xviii, p. 215] lasting a few days. The *B.* spp. lived for 12 to 14 days and sporulated for two to four shortly before the cessation of growth.

Scheffer (T. C.) & Chidester (Mae S.). **Significance of air-dry wood in controlling rot caused by Poria incrassata.** *Sth. Lumberm.*, clxvi, 2091, pp. 53–55, 1943.

In loblolly pine [*Pinus taeda*] sapwood blocks, 1 by 1 by ½ in., inoculated with three strains of the building-decay fungus, *Poria incrassata*, two from Virginia and one from Missouri, and placed in the drying room with a maintained relative humidity of 65° and a temperature of 80° F. the adjustment of the moisture content to 8 per cent. resulted in the death of the organism within one day. At moisture contents between 13 and 22 per cent. the period of survival became progressively longer, but in no case did it exceed 13 days. In naturally infected wood from decayed buildings the maximum survival period ranged from 25 to 32 days, owing partly to the specimens being large and painted. The strain of *P. incrassata* from this material, inoculated into wood blocks in the laboratory, succumbed in 13 days following the reduction of the moisture content from 30 to 22 per cent.

It is concluded from these data that the risk of survival of *P. incrassata* in thoroughly air-dried wood for periods exceeding a month is negligible. Even in the most humid regions of the United States the maximum moisture content of such wood does not ordinarily rise above 26 per cent., and in most sections and seasons it is under 20.

Muntz (H. H.). **The preservative treatment of fence posts for southern farms.** – *Sth. Lumberm.*, clxvii, 2097, pp. 65–66, 68, 3 figs., 1943.

Particulars concerning the relative durability of the various species of hardwoods used for fence posts on farms in the southern United States have already been furnished from another source [*R.A.M.*, xxiii, p. 322]. Consequent upon tests at the Delta Experimental Forest, Stoneville, Mississippi, the following hot- and cold-bath schedule is recommended for the treatment of average-sized posts (7 ft. long with a 4½ in. top diameter): ash 90 and 40 minutes, respectively, bald cypress [*Taxodium distichum*] sapwood 90 and 15, white elm [*Ulmus americana*] 90 and 15, rock elm [*U. thomasi*] 90 and 20, hackberry [*Celtis* (?) *laevigata*] 75 and 15, honey locust [*Gleditschia triacanthos*] 90 and 15, maple [*Acer*] 90 and 20, oak [? overcup – *Quercus lyrata*] 90 and 15, pecan 105 and 60, persimmon 105 and 50, sweet gum [*Liquidambar styraciflua*] 90 and 15, and willow [*Salix*] 75 and 20. Penetration generally ranges from ⅛ to ¼ in., representing an absorption of 8 lb. oil per cu. ft. or ¾ gal. per post of the above-mentioned size. Seasoning for one to two months before impregnation is advisable to facilitate infiltration of the oil and prevent cracking after immersion. The plant used at the Experimental Forest consisted of two 1,200-gal. tanks, placed end-to-end with a Dutch oven under one and a working platform and guard-rail round each, prompt transference of the posts from the heated to the cold tank being effected by means of a chain

hoist on an overhead trolley. For the average farm an apparatus made from two 110-gal. oil drums or other metal tanks of comparable capacity would probably be more appropriate, though permitting only of butt treatment. The oil in the hot tank should be pure coal tar creosote, maintained at a constant temperature of 220° F.; in the cold tank, kept at air temperature, the creosote oil should be mixed with an equal amount of diesel fuel oil, which costs only about one-third as much as creosote. The cost of the oil required for the treatment of one post usually varies between 10 and 30 cents, but a substantial reduction can be effected by bulk purchases and modifications of the method of immersion whereby the hot bath is applied to the whole length of the post but the cold one only to the lower half. In any case, the cost of preservation is nominal compared with the increased service obtained, the life of treated woods of the less durable species amounting to 15 or 20 years as against only a few for the untreated.

Davis (W. C.), Wright (E.), & Hartley (C.). **Diseases of forest-tree nursery stock.**—*For. Publ. civ. Conserv. Cps* 9, iv+79 pp., 1 pl., 14 figs., 1942. [Received July, 1944.]

In this work the authors present information regarding the causes of the more prevalent diseases found in forest-tree nurseries in the United States, their chemical treatment, and general practices that will reduce losses occasioned by such diseases. The points dealt with cover preventive measures (e.g., selection and preparation of nursery sites, drainage, sanitation, cultural practices, etc.), diseases not of fungal origin (injuries due to weather, mechanical agencies, deficiency diseases, etc.), fungal diseases of broadleaf species, diseases of specific hosts, fungal diseases of conifers and the control of all these, mycorrhiza, spraying, and the preparation of spray mixtures and care of equipment. On pp. 46–49 a key to the fungal diseases of conifers is presented. Directions are given for spraying against conifer rusts. Diseases of specific hosts dealt with (pp. 34–45) include, among others: *Marssonia fraxini* [*Mycosphaerella effigurata*: *R.A.M.*, xxi, p. 54] on ash leaves, *Coccomyces lutescens* [ibid., viii, p. 120] on *Prunus serotina*, *P. virginiana*, and *P. melanocarpa*, causing shot hole, *C. prunophorae* on *P. americana* (which is resistant to *C. lutescens*), *Chalaropsis thielavioides* [ibid., xxi, p. 19; xxii, p. 219] and *Gnomonia ulmea* [ibid., xx, p. 610] on elm, *Phytophthora parasitica* on black locust [*Robinia pseud-acacia*], *Sclerotium bataticola* [*Macrophomina phaseoli*] on maple, [*Acer*: cf. ibid., xxi, p. 275], and *P. cinnamomi* causing root rot of walnut [cf. ibid., xviii, p. 825].

Lorenz (R. C.). **Discolorations and decay resulting from increment borings in hardwoods.**—*J. For.*, xlii, 1, pp. 37–43, 2 figs., 1944.

The increment borings commonly made by foresters in trees have been observed to induce discolorations, cankers, and decay. The author's investigations on 19 bored basswood (*Tilia americana*), 13 sugar maple (*Acer saccharum*), 13 yellow birch (*Betula lutea*), and 10 paper birch (*B. papyrifera*) trees in northern Minnesota showed that stain (which is of chemical origin unconnected with micro-organisms [*R.A.M.*, xxiii, p. 200]) invariably develops in the wood adjacent to the holes, while fungal damage is prevalent but not universal. The insertion into the holes of plugs of black locust [*Robinia pseud-acacia*] heartwood failed to prevent the development of stain but somewhat reduced the incidence of heart rots (*Polyporus* and *Pholiota* spp.). Common wound fungi included species of *Torula*, *Coniochaeta*, *Fusarium*, *Ceratostomella*, *Peniophora*, and *Alternaria*. The colour of the stains was reddish-yellow in the birches, dark grey in the basswood, and salmon-coloured, with small, dark green marginal streaks, in the sugar maple. A staining of stored paper birch bolts, originally reported by I. W. Bailey (*Bot. Gaz.*, l, pp. 142–147, 1910) and observed by the writer since 1927, was likewise experimentally shown

to be quite unrelated to microbiological activity. The defect appears to exert no adverse effect on the strength of the wood.

Haskell (R. J.). **Disinfectants and protectants prevent seed losses.**—*Food Packer* (formerly *Canning Age*), xxv, 5, pp. 42–43, 1944.

Directions are given for the treatment against seed- and soil-borne diseases of peas, tomatoes, sweet corn [maize], Lima beans [*Phaseolus lunatus*], spinach, and beets. Wrinkled, 'sweet' varieties of peas, such as Surprise, Perfection, Alderman, and Thomas Laxton, are particularly liable to decay by soil fungi, the smooth, starchy Alaska and related types being more resistant. Seed disinfection of the latter has hitherto been considered superfluous, but with the development of modern chemical protectants it appears advisable to extend the scope of the treatment to cover this group. The preparations recommended for application to peas are spergon (1½ oz. per bush. seed), arasan (1½ to 2 oz.) [*R.A.M.*, xxiii, p. 328], and semesan (2 to 2½ oz.), their prices per lb. being $1.00 to 1.40, $1.15 to 1.60, and $2.00 to 2.50, respectively. The admixture of fine-grade graphite powder (1 oz.) for seed lubrication purposes is desirable in the case of semesan and optional in that of arasan; it is not required with spergon.

Among the tomato diseases partly controllable by seed treatment are bacterial spot [*Xanthomonas vesicatoria*], bacterial canker [*Corynebacterium michiganense*], anthracnose [*Colletotrichum phomoides*], and the blights caused by *Septoria* [*lycopersici*] and *Alternaria* [*solani*], respectively [ibid., xxiii, p. 318]. Seed may be treated by 25 minutes' immersion in hot water (122° F.) or five minutes in mercuric chloride (1 in 2,000), or with new improved ceresan (1 oz. in 9 gals.), followed in all cases by the use of a protectant against damping-off and seed decay, e.g., one hour's immersion in copper sulphate (2 oz. per gal.), the seed to be planted immediately afterwards, or dusting with semesan (½ oz. per 15 lb.) or arasan (1 level teaspoonful per lb.).

Sweet corn seedling blights and seed decay may be combated by treatment with arasan, semesan jr., or barbak C (1½, 1½, and 1½ to 2 oz. per bush., respectively). Spergon and arasan (both at 2 oz. per bush.) are recommended for the control of seed rot and damping-off in Lima beans, and the same preparations may be useful in producing good stands of 'snap' beans. Red and yellow copper oxides are effective against seed decay and damping-off in spinach, but since they are not generally available at present, the following may be substituted: arasan (2 oz. per bush.), zinc oxide (1 lb. per 100 lb. seed), semesan (4½ oz. per 100 lb.), or one hour's immersion in copper sulphate (2 oz. per gal.). Damping-off of beet may be reduced by dusting with arasan or semesan (4 and 1 oz. per 100 lb. seed, respectively), or by the copper sulphate dip, as for spinach.

Hopkins (J. C. F.) & Pardy (Marie H.). **Diseases of fruit, flowers, and vegetables in Southern Rhodesia. 8. Yellows disease of Cabbage.**—*Rhod. agric. J.*, xli, 2, pp. 63–67, 2 figs., 1944.

In February, 1943, cabbage plants affected with yellows (*Fusarium conglutinans*) [*R.A.M.*, xxii, pp. 234, 291] were received for examination at the Department of Agriculture, Southern Rhodesia, and subsequent investigations confirmed the presence of the disease in the Colony. The worst cases occurred during hot, dry weather, and during the recent drought in the Umtali district the crops were almost entirely destroyed.

Infected plants may show up in the seed-bed or from two to four weeks after transplanting. They are stunted and pale yellow-green with small, malformed leaves and the stems may become twisted and warped. The stem in cross-section shows a dark ring (but never a black ring, characteristic of black rot, *Xanthomonas campestris*) and the overlying tissues die off and are shed. Many plants wilt and

finally die. The causal fungus was isolated in pure culture and its pathogenicity was established in inoculation experiments, the fungus being re-isolated. The conidia were preponderantly 0-septate; a few 3-septate ones were seen, but 1-, 4-, 5-, or 7-septate conidia were rare. The microconidia were ovoid, straight, or reniform, and the macroconidia elongate and tapering at both ends. Spore measurements ranged from 6 to 10 by 2 to 3 μ on lupin stems (0-septate) to 29 by 4 to 5 μ on potato dextrose agar (7-septate) and 23 to 33 by 2 to 4 μ on oat agar (4-septate). It is considered that identification of the fungus with *F. conglutinans* is warranted.

Walker (J. C.), Stahmann (M. A.), & Pryor (D. E.). **Efficacy of fungicidal transplanting liquids for control of clubroot of Cabbage.**—*Phytopathology*, xxxiv, 2, pp. 185–195, 2 figs., 1944.

A tabulated survey is given of four seasons' laboratory and field experiments in Wisconsin in the control of club root of cabbage (*Plasmodiophora brassicae*) by means of the introduction into the transplanting liquid of various chemicals, of which mercuric chloride (1 in 750 or 1 in 1,500 at the rate of 60 to 125 ml. per plant) gave the most encouraging results, both on mineral and muck soils. Although the elimination of infection was not complete, the increased yields secured by the treatment often repaid the cost of the latter many times. In one test, for instance, the yields per acre in the untreated, 1 in 1,500, and 1 in 750 plots (138 ml. per plant) were 7·82, 12·51, and 13·07 tons. The mercuric chloride treatment should not at present be regarded as a substitute for such well-established remedial practices as crop rotation, seed-bed sanitation, and liming, but merely as a useful accessory, especially on mildly infested muck soils where the high buffer action frequently counteracts the beneficial effect of liming.

MacLachlan (J. D.). **Control of water-core of Turnips by spraying with borax.**—*Sci. Agric.*, xxiv, 7, pp. 327–331, 1944.

Losses (except as stock feed) from water core, a physiological disease of turnips due to boron deficiency, has been estimated in Ontario at as high as 20 per cent. in some years. Attempts to control the disorder by soil application of boron met with many failures, probably partly owing to the high lime content of the soil. Even an application of 100 lb. per acre at the Ontario Agricultural College resulted in no control. Almost complete control, on the other hand, was obtained in small plot experiments during 1940–1 and field trials in 1942 with boron spraying [*R.A.M.*, xxii, p. 163]; similar experiments on a commercial scale in 1943 gave equally outstanding results. It was found that no foliar burning was caused by spraying and no mechanical injury to leaves occurred from the wheels of sprayers whether drawn by horse or tractor, that it was sufficient to spray the upper surfaces of leaves only, and that any type of spraying machine could be used so long as a uniform coverage was obtained. On the basis of the tests, and pending further investigations with regard to the use of stickers and spreaders, the following spray composition and spraying programme are proposed. Borax dissolved in water at the rate of 8 lb. per 40 gals. (or a saturated solution of borax in cold water) is mixed with bentonite clay at the rate of 2 lb. to 40 gals. borax solution, the mixture is screened into the spray tank, and ½ pint liquid orvus is stirred into it. Forty gals. of spray is sufficient for one acre. Only one spraying, applied when the roots are 1 to 1½ but not more than 2 in. in diameter, is stated to be sufficient in cases of mild or moderate attack of water core, but a second one, applied one month later, is necessary to control severe outbreaks.

Kassanis (B.). **A virus attacking Lettuce and Dandelion.**—*Nature, Lond.*, cliv, 3896, p. 16, 1944.

The name dandelion (*Taraxacum officinale*) yellow mosaic virus is suggested for

the agent of a disease of lettuce recorded during three years in various parts of Britain, and found to be also responsible for the chlorotic rings and spots commonly observed in dandelion, a perennial host, which accordingly is selected for the common name of the virus. The disease is stated to be more severe than the common lettuce mosaic [*R.A.M.*, xix, p. 561] and to be readily distinguished from it. Bronzing of young lettuce leaves appears one to two weeks after infection. In the greenhouse this initial fine, brown necrosis developing along the veins and in the interveinal areas is usually followed by chlorosis, dwarfing, and malformation of the whole plants; out-of-doors, necrosis remains the chief symptom, the leaves turning black and shrivelling up, and whole plants being rendered worthless. The virus was only transmitted by sap inoculation when some abrasive, such as carborundum, was used; it was also transmitted by *Myzus ornatus* and *M. pseudosolani*, but not by *M. persicae*. The vectors became infective only after at least three hours' feeding on infected material, and the number that becomes infective increases with increased feeding time. But even after feeding for as long as three days the aphids ceased to be infective within an hour.

Van Koot (Y.). **Enkele onderzoekingen betreffende de Fusarium-ziekte bij de Komkommer.** [Some investigations relating to the *Fusarium* disease of the Cucumber.]—*Tijdschr. PlZiekt.*, xlix, pp. 52–72, 1943. [Abs. in *Zbl. Bakt.*, Abt. 2, cvi, 11–12, p. 232, 1944.]

The following *Fusarium* species were isolated from cucumbers affected by foot rot and wilt in Holland: *F. solani* and its var. *martii*, *F. orthoceras* and its var. *longius*, and *F. angustum*. The symptoms induced by artificial infection were identical with those observed in nature, consisting in a brown discoloration of the stem base and portions of the roots, severe attacks invariably resulting in the death of the plants. Melons and kidney beans also proved susceptible in inoculation experiments, *F. solani* var. *martii* being the chief pathogen of the latter host. Of the soil-sterilizers tested in soil cultures of the fungi in Erlenmeyer flasks, chloropicrin and formalin were the most effective.

Ivanoff (S. S.). **Resistance of Cantaloupes to downy mildew and the Melon aphid.**—*J. Hered.*, xxv, 2, pp. 35–39, 3 figs., 1944.

Under the conditions prevailing in southern Texas four cantaloupe varieties of West Indian origin, Smith's Perfect, Green Fleshed Rocky Dew, Orange Fleshed Rocky Dew, and Cuban Castilian have proved resistant to downy mildew (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) [*R.A.M.*, xxii, p. 54] and *Aphis gossypii*. Crosses were made between these and various non-resistant commercial varieties in an attempt to develop a shipping cantaloupe of the Hale's Best type that should be similarly resistant. Resistance to downy mildew and aphids appeared as partly dominant in the F_1 generation, but in later ones highly resistant lines were obtained which also possessed desirable commercial qualities. Further improvements of these strains are being attempted and it is hoped to produce a melon resistant to the powdery mildew [*Erysiphe cichoracearum*] as well as to *P. cubensis* and *A. gossypii*.

Beattie (J. H.), Doolittle (S. P.), Beattie (W. R.), Magruder (R.), & Webster (R. E.). **Production of Peppers.** *Leafl. U.S. Dep. Agric.* 140, 7 pp., 1944.

Damping-off of chilli pepper (*Capsicum frutescens*) [*R.A.M.*, xviii, p. 440] causes seed decay and seedling collapse; most of the seed decay can be prevented by dusting the seed with cuprocide (one level teaspoonful per lb. seed) or semesan. Excessive watering of the seed-beds should be avoided, and plants in cold frames should be well ventilated. Bacterial spot [*Xanthomonas vesicatoria*: ibid., xix,

p. 451] can be controlled by soaking the seed for not more than two minutes in a 1 in 2,000 solution of mercuric chloride, followed by thorough washing in water and immediate drying. Applications of Bordeaux mixture (3-3–50) at 7- to 10-day intervals will help to check leaf infection. Peppers should not be grown near tomatoes, or be planted on the same land more often than once in three or four years. Tomatoes should never be followed by peppers in successive years. The same seed treatment and spraying methods may be used against *Cercospora* leaf spot [*C. capsici*: ibid., xix, p. 507], though spraying may not be economically worth while unless the disease is severe. Rotation may also reduce losses.

The only control methods of any avail against *Sclerotium* blight [*S. rolfsii*: ibid., xxi, p. 126] are rotation and clean culture.

It was reported that *Fusarium* wilt [? *F. annuum*: ibid., xiv, p. 7] can be partially controlled by setting the plants on ridges or by avoiding excessive irrigation. Against *Phytophthora* blight [? *P. capsici*: ibid., xxii, p. 380] spraying with Bordeaux mixture has been recommended; seed should never be saved from fruits of affected plants.

Blossom-end rot, induced by low soil moisture [ibid., xiv, p. 344], is aggravated by heavy applications of nitrogenous fertilizer; where irrigation is practised, care should be taken to maintain an even supply of moisture in the soil.

Against anthracnose [*Glomerella cingulata*: loc. cit.] crop rotation and the use of seed from sound fruits are the best means of control. Of the mosaic diseases attacking peppers [ibid., xxi, p. 408] the commonest is caused by cucumber mosaic virus. Control consists in clean cultivation in and about the fields to destroy perennial weeds, and the application of nicotine sulphate as a spray or a dust. Peppers should not be planted near cucumbers, celery, or tomatoes.

Porter (R. P.) & Parris (G. K.). **Sweet Potato sprout treatments for the control of Fusarium wilt, ineffective on the eastern shore of Virginia.**—*Trans. Peninsula hort. Soc., 1943*, pp. 85–88, 1944.

Data [which are tabulated] obtained during 1943 in Virginia showed that a pre-planting dip of sweet potato sprouts in either wettable spergon, semesan bel, yellow cuprocide, fermate, or thiasan had no significant effect in reducing the incidence of stem rot or blue stem, caused by *Fusarium oxysporum* var. *batatas* or in increasing the yields [*R.A.M.*, xxii, p. 510].

Iljin (W. S.). **Der Stoffwechsel bei der Weinrebe während der Kalkchlorose.** [Vine metabolism during lime-induced chlorosis.]—*Gartenbauwiss.*, xvii, pp. 338–381, 1943. [Abs. in *Chem. Zbl.*, cxiv (ii), 18, p. 1642, 1943.]

In the writer's studies on vine chlorosis [*R.A.M.*, xxii, p. 144] at the Institute of Balneology, Baden, near Vienna, and at the Karl University, Prague, the analysis of chlorotic foliage of vines growing in high-calcium soils revealed an abnormally high water content, which approximated more and more closely to the normal as recovery proceeded. In the early part of the summer the sugar content of the diseased leaves is very low, but it slowly rises until equality with the normal ones is reached in August; at this time the sugar in the latter undergoes rapid disorganization, whereas it is retained in the chlorotic foliage until the end of the summer. Starch formation is not impeded in the chlorotic vines, nor does the late summer disorganization typical of normal plants take place. Diseased leaves contain more citric acid than normal ones. Nitrogen is present in chlorotic foliage up to 30 per cent. in soluble form (mostly amino acids), in contrast to the healthy leaves, in which the soluble nitrogen decreases with advancing maturity. The iron content of chlorotic leaves was often higher than that of healthy ones, and in no case appreciably lower, but the former were poorer in calcium than the latter, the ratio

of calcium to potash rising in normal and falling in diseased vines in the course of development.

Lyon (A. V.). **Characteristics of black spot.**—*Aust. Dried Fruits News*, xx, 4, p. 9, 1943.

A popular note is given on the life-history of vine black spot or 'bird's eye fungus' [*Elsinoe ampelina*], which develops in Victoria [*R.A.M.*, xxiii, p. 88] following showery weather in November: in most seasons, however, the rainfall is insufficient at the critical period to promote heavy damage by the pathogen. Spraying with Bordeaux mixture is purely preventive and quite ineffectual once the pathogen has gained ingress and formed lesions on the foliage. At one time it was customary to treat the dormant vines with an acid iron swab or spray to kill the fungus on the wood, but this useful practice having often proved superfluous under the weather conditions of recent seasons, it has been widely discontinued.

Kaiser (M.). **Folgerungen der Forschung über Kälte- und Trockenresistenz kleinster pflanzlicher Zellen für die Methodik der Viruskonservierung.** [Consequences of the study of cold and drought resistance of the smallest plant cells for the technique of virus preservation.]—*Biol. gen.*, xvi, pp. 513–553, 1942. [Abs. in *Chem. Zbl.*, cxv (i), 6, p. 358, 1944.]

A comprehensive survey is given of the literature on the effects of cold and drought on plant cells. Death from these causes is attributed to a colloid-chemical, irreversible change in the condition of the cell substance associated with dehydration through ice formation or desiccation. Such substances as carbohydrates and glycerine appear to be capable of penetrating into the interior of the cells, where their well-known protective action against cold and the dehydration of the tissues is evidently exerted. Viruses are able to withstand minimum temperatures and extreme dryness for very lengthy periods, whence practical applications for their preservation may be deduced.

Seiffert (G.). **Viruses diseases in man, animal, and plant.**—ix + 332 pp., 7 figs., New York, Philosophical Library, 1944. $5.00.

This is a translation (by Marion L. Taylor) of a book first published in 1938 and already noted in this *Review* [*R.A.M.*, xvii, p. 616]. No attempt appears to have been made to bring the book up-to-date. It opens with a section (pp. 1–90) on general aspects of viruses and concludes (pp. 298–322) with notes on methods of virus investigation. The main body of the book (pp. 91–263) discusses the most important virus diseases of man, animals, and plants; those of plants, apart from incidental references in other parts of the work, being briefly dealt with in a 10-page chapter.

Laboratorio de Cryptogamia. *Ex* **Memoria Estación de Fitopatología Agrícola de La Coruña, 1942.** [Cryptogamic Laboratory. *Ex* Report of the Corunna Station of Agricultural Phytopathology, 1942.]—*Publ. Estac. Fitopat. agríc. Coruña* 23, pp. 21–57, 35 figs., 2 diags., 2 graphs, 1943.

In further studies on chestnut ink disease (*Phytophthora cambivora*), Leonian and Geer's standardized method for the comparison of sporangial dimensions in different *P. spp.* [*R.A.M.*, ix, p. 135] was found by P. Urquijo Landaluze to be inapplicable to the fungus in question owing to the paucity of fruit bodies developing under the prescribed conditions. The most suitable medium for the purpose in view was a 0·25 per cent. soil extract, on which the mean sporangial dimensions (in μ) of eight isolates of *P. cambivora* (100 sporangia of each) were as

follows: Petri's 43·6 by 27·6, Leonian's 42·4 by 23·0, Dufrénoy's 43·6 by 24·1, two of the writer's (from Corunna and Meirás) 54·1 by 31·3 and 54·4 by 31·4, respectively, from *Castanea dentata* 55·9 by 29·0, walnut 63·8 by 35·8, and *Erica* 56·3 by 32·2. In cross-inoculation experiments the numbers of positive infections secured on chestnut seedlings with Petri's, Leonian's, Dufrénoy's and the author's isolates, and those from *C. dentata*, *Erica*, and walnut were 11 out of 19, 16 out of 18, 7 out of 10, 84 out of 85, 10 out of 10, 10 out of 10, and 9 out of 10, respectively. A few tests were made on the Japanese chestnut, *C. crenata* var. *tamba*, on which positive results were obtained with Leonian's, Dufrénoy's and the author's isolates and the *Erica* strain. In the case of walnut, out of four inoculations each with Petri's, Leonian's, and Dufrénoy's isolates, and the *C. dentata*, *Erica*, and walnut strains, and eight with the author's collections, 3, 2, 0, 5, 2, 4, and 3, respectively, were successful. These data are regarded as suggestive of the existence within *P. cambivora* of multiple varieties or forms which are not, however, specifically related to any particular host. In this connexion attention is drawn to the marked morphological and biological similarity between the *Erica* strain and the Meirás chestnut isolate, indicating the potential importance of the heath tribe in the propagation of the pathogen. The mechanism of resistance in *C. crenata* var. *tamba* to the agent of ink disease appears to be of the same order as in the walnut, i.e., infection takes place but an *a posteriori* defensive reaction is set up which localizes its development.

It is of interest to note that, out of five inoculations on chestnut with *P. citrophthora*, a species closely allied to *P. cambivora*, four were positive.

The examination of sections, stained with diphenyl carbacide, of chestnut seedling roots treated against the ink disease with the lethal dose (1 in 100,000) of copper carbonate or copper oxychloride showed that the fungicides do not remain fixed in the tissues, but diffuse into the protoplasmic contents. In other experiments with cultures of the fungus on malt extract, certain zones were traced with a rod dipped in one or other of the copper compounds, at some distance from which the further advance of the mycelium was arrested, whereas normal growth proceeded on the other parts of the dish, denoting that the infinitesimal amount of the copper ion diffusing into the medium sufficed to inhibit the development of the pathogen.

Four *C. crenata* var. *tamba* plants growing in Shive and Robbins's nutrient solution in Erlenmeyer flasks, were inoculated by J. R. Sardiña with (1) Heald's (United States) strain of *Endothia parasitica* [ibid., xxii, p. 53], (2) a non-pigmented strain of *Cytospora* sp., (3) a strain of the same secreting a raspberry-coloured pigment, the two last both isolated in Spain from areas of chestnut bark subjacent to cankers and bearing orange pustules, and (4) a species of (?) *Ceuthospora* from a cankered Japanese variety of *Castanea crenata*. The plant inoculated with *E. parasitica* died, but attempts at the reisolation of the fungus from the necrotic portion of the stem were unsuccessful. The non-pigmented *Cytospora* induced temporary wilting.

Inoculation experiments conducted by J. R. Sardiña with the chilli 'blanching' virus [ibid., xxi, p. 404] on *Nicotiana glutinosa* resulted in the separation of the two component parts of the complex, viz., tobacco mosaic and tobacco leaf curl. Transmission was effected by mechanical means alone without the intervention of aphids. Tobacco plants inoculated early in 1942 with the mosaic component developed pallor of the interveinal areas, a symptom apparent in adult leaves only, while the leaf-curl virus merely induced crinkling of the lamina near its juncture with the petiole. In *N. glutinosa* a few minute, yellow dots constituted the sole evidence of mosaic infection, while the leaf-curl component caused the appearance of yellow necrotic zones. As the season advanced, however, the symptoms arising from each fresh series of inoculations became increasingly fainter and finally disappeared, presumably owing to the heat of the greenhouse. The investigations

have therefore been discontinued pending the provision of proper equipment for the study of plant viruses.

A virus of the mosaic type was transmitted by rubbing from stock (*Matthiola [incana* var.] *annua*) [ibid., xviii, p. 459] to *Malcomia littorea* with 90 to 100 per cent. positive infections, which assumed, however, a quite atypical and very severe form, consisting of necrotic areas along the leaf veins, isolated at first but later extending over the entire lamina and involving all the new foliage in succession.

Cauliflower mosaic [ibid., xxii, p. 122] was successfully transferred to all the cabbage plants used in inoculation tests.

New records for the year include a species of *Acrocylindrium* in the collar and roots, and one of *Clonostachys* in the tap root, of chestnuts unsuccessfully inoculated with *Cytospora* sp.; *Lophodermium pinastri* on pine [ibid., xxii, p. 186]; *Oidiopsis sicula* [*O. taurica*] on chilli [ibid., xix, p. 167; cf. xxi, p. 404]; *Peronospora viciae* on peas; and *Corticium solani* on the root collar, petioles, and under sides of potato leaves, no trace of the *Rhizoctonia* stage being discernible on the underground system.

Experiments were carried out in a number of vineyards in different parts of the country under the supervision of J. R. Sardiña and P. Urquijo Landaluze to determine the relative efficiency of various formulae designed to save copper in the treatment of vine downy mildew (*Plasmopara viticola*), the results of which may be summarized as follows. The only substitutes for the standard 2 per cent. Bordeaux mixture that can be recommended are Menozzi's formula, consisting of 1 kg. each copper and iron sulphate per 100 l. water, with the addition of sufficient lime to induce an alkaline reaction, and a mixture of 1 kg. copper sulphate and 1·5 l. concentrated lime-sulphur per 100 l. water, again with sufficient lime for alkalinity. Taking the number 10 to represent absolute protection, the two formulae in question are assigned grades of 8·4 and 9, respectively, the performance of Bordeaux mixture also being expressed by the latter figure. Actually, the best control was obtained by dusting with copper carbonate or copper oxychloride (9·7 and 9·2, respectively), both of which, however, are more wasteful of copper than Bordeaux or the other formulae tested, and therefore cannot be considered for fungicidal purposes during the present juncture. The outcome of the laboratory experiments by P. Urquijo Landaluze to determine the relative mortality among sporangia of *P. viticola* on slides or vine leaves exposed to contact with various fungicides (either by spraying for 15 minutes or two hours' immersion) supported the conclusions reached in the field concerning the efficacy of the copper sulphate (1·5–4 or 1–4) and Menozzi formulae, which were rated at 84, 76, and 78 per cent., respectively, compared with 90, 95, and 98 per cent., respectively, for 1, 2, and 3 per cent. Bordeaux mixture.

Plant diseases. Notes contributed by the Biological Branch. *Agric. Gaz. N.S.W.*, lv, 4, pp. 153–158, 9 figs., 1944.

Leaf spot due to *Cercospora beticola* [*R.A.M.*, xxi, p. 358; xxii, p. 508] is the commonest disease of silver beet and beetroot in New South Wales. New beet crops should not be planted near old, infected ones. The seed should be dusted with one of the proprietary organic mercury dusts (1 level teaspoonful per lb.) or copper oxychloride dust (4 level teaspoonfuls per lb.). If silver beets become affected, the diseased leaves should be removed and burnt, and the plants kept well trimmed back. As a rule, spraying is not worth while, because if the crop is kept growing quickly and is constantly picked, the fungus will be unable to establish itself. Should spring sown seedlings be attacked at an early stage, Bordeaux mixture (4–4–40) may be applied after the infected leaves have been removed, a second application being made seven to ten days later. Only young plants which have not reached the picking stage should be sprayed.

In some parts of the metropolitan area lettuce-growing is unprofitable in seasons when tomato spotted wilt virus [ibid., xxi, p. 244] is prevalent.

Seedling cabbages and cauliflowers should be sprayed at weekly intervals from the time the seedlings are 1 in. high with Bordeaux mixture (1–1–10) against downy mildew [*Peronospora parasitica*].

The chief diseases of strawberries in New South Wales are crinkle [ibid., xxii, p. 32], leaf spot [*Mycosphaerella fragariae*: ibid., xxi, p. 533], leaf scorch [*Diplocarpon earliana*; ibid., xxi, p. 463], leaf blight [*Dendrophoma obscurans*: loc. cit.], and *Rhizoctonia* wilt [ibid., xiv, p. 348]. Crinkle is the most serious, but the leaf-spot diseases may sometimes cause loss, and wilt may be a limiting factor in the heavier soils under wet conditions. Runners should not be used for propagations from beds infected with wilt, and infected land should not be planted to strawberries. Steeping the sets in Bordeaux mixture or copper oxychloride is a useful safeguard.

Coleman (Madeline F.) & Reid (J. J.). **The serological relationship of Phytomonas tumefaciens and Alcaligenes radiobacter.**—Abs. in *J. Bact.*, xlvii, 5, pp. 420–421, 1944.

At the Pennsylvania State College a serological study was made of six strains of *Alcaligenes radiobacter* [*R.A.M.*, xxiii, p. 168] and two of *Phytomonas* [*Bacterium*] *tumefaciens*. M-phase cultures were used in the rapid immunization of animals, and cross reactions between the two species were not observed in significant dilutions, although the *A. radiobacter* strains were found to be antigenically similar and those of *Bact. tumefaciens* identical.

Conversion of single-cell strains of the two species to the Dawson S-phase was effected by serial transfer in a medium containing 10 per cent. homologous M-phase antiserum. Rapid immunization of animals with the resultant cultures yielded antiserum that did not react in significant dilution with cells of the homologous strain in the M-phase. Complete reciprocal agglutinin absorption, however, showed the single-cell strain of *A. radiobacter* in the Dawson S-phase to be serologically identical with that of *Bact. tumefaciens* in the same phase. The latter was then cultured in yeast-extract mineral salts broth containing 10 per cent. homologous S-phase antiserum, 10 per cent. homologous M-phase antiserum, and a small amount of sterile capsular material from an M-phase culture of *A. radiobacter*. Serial transfer in this medium yielded an organism serologically identical with *A. radiobacter* in the M-phase. Conversion of *A. radiobacter* in the Dawson S-phase to an M-phase serologically identical with *Bact. tumefaciens* has not been completed.

Garrigues (R.). **Recherches cytologiques sur les tumeurs à Phytomonas tumefaciens.** [Cytological researches on the tumours due to *Phytomonas tumefaciens*.]—*C.R. Acad. Sci., Paris*, ccxvii, 9, pp. 235–237, 1943.

Cytological studies on the tumours of sunflower and *Pelargonium zonale* inoculated with crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) revealed none of the abnormalities of mitosis associated with human and animal cancer and lend no support to the theory of a connexion between the plant disease and that of man [cf. *R.A.M.*, xxiii, p. 8]. As already shown by Riker [ibid., vii, p. 144 *et passim*], crown gall does not spread, like human cancer, by means of metastases, nor is there any deterioration in the general health of the majority of infected plants. The writer's *P. zonale* plants continued to flourish after several series of inoculations producing neoplasms.

Smith (C. O.) & Cochran (L. C.). **Crown gall and irrigation water.**—*Plant Dis. Reptr*, xxviii, 4–5, pp. 160–162, 1944. [Mimeographed.]

Data presented here on two outbreaks of crown gall, *Agrobacterium* [*Bacterium*]

tumefaciens [*R.A.M.*, xx, p. 3], in experimental peach nurseries in California in 1941 and 1943, where the heavy infection (up to 75 per cent. of seedlings in 1943) could not be explained by soil contamination, show that in both cases the irrigation water applied at the time of planting had passed either beneath or through bearing peach orchards. When the water came directly from mountain reservoirs and wells, the planting was largely free from crown gall. It is concluded that the two outbreaks are due to contamination through irrigation water, which may thus be regarded as an important agent in spreading crown gall. This view was further confirmed by the results of an infection experiment, in which peach seed in pots watered with tap water produced an average 7·5 per cent. infected seedlings, while those from seed watered once with wash water from peach crown galls and thereafter with tap water yielded an average of 54·4 per cent. infected plants.

Vieira (J. T.). **'Lagartão' ou 'vassoura de bruxa'.** ['Lagartão' or 'witches' broom'.]—*Bol. Minist. Agric., Rio de J.*, xxxi, 11, pp. 39–44, 1942 (issued 1943).

The writer briefly summarizes the available information concerning the history, distribution, symptomatology, etiology, economic importance, and control of 'lagartão' [caterpillar] or 'witches' broom' of cacao (*Marasmius perniciosus*), with special reference to the Amazon Valley, Brazil [*R.A.M.*, xxii, p. 242]. Care should be taken, in a study of the history of the disease, not to confuse the date of its first recorded appearance (1936, for instance, in Pará) with the actual presence of the fungus in the country or region under observation. Witches' broom, under its vernacular name of 'lagartão', is thought to have existed in the Amazon Valley for a century or so.

Besides cacao, *Theobroma grandiflorum* is susceptible to witches' broom. A key is given for the differentiation of the symptoms caused by *M. perniciosus* from those of die-back and pod rot (*Botryodiplodia theobromae*) canker, and wither tip, due to the combined action of sun and wind. The estimated loss of yield from *M. perniciosus* in the municipality of Santarem is of the order of 60 per cent.

Posnette (A. F.). **Virus diseases of Cacao in Trinidad.** *Trop. Agriculture, Trin.*, xxi, 6, pp. 105–106, 3 figs., 1 map, 1944.

A disease of cacao observed at River Estate, Trinidad, in 1943, in several fields from 5 to 25 years old, and later found in the neighbouring Santa Cruz and Maracas valleys, was demonstrated by transmission experiments to be due to two viruses, here designated the red mottle and the vein-clearing. The red mottle virus induces the presence of a red pigment along some of the main veins of the young leaf, forming a feather-like pattern. In the mature leaf this pigment persists long after the whole leaf, which is normally pink or red when young, has turned green, and sometimes remains permanently faintly visible. Occasionally the mottle forms a network over the whole lamina. In some clones the red mottle appears on young pods, persisting until the pod is about one third grown. Mosaic often develops on red mottle-infected trees, causing a conspicuous patchy clearing along the sides of veins, which turns yellow in mature leaves. Crinkling of the leaf and necrosis of the tip are occasional but not reliable symptoms of red mottle. The virus was transmissible by grafting to 11 seedlings out of 22, all the controls remaining healthy. The incubation period varied from 94 to 119 days (average of 98). The virus was not inactivated in budwood immersed in water for 10 minutes at 50° C. or for 45 at 43·4°.

The vein-clearing virus produces a very prominent continuous clearing of all veins, so that a yellow network forms all over the leaf. Leaf-crinkling is more pronounced with this virus than with red mottle. The virus was transmitted by grafting to four stocks, the incubation period varying from 45 to 130 days.

The disease in Trinidad resembles the swollen-shoot disease in the Gold Coast [*R.A.M.*, xxiii, p. 6] in some leaf symptoms and in the manner of spreading, but differs from it in the absence of swellings.

There were marked differences in tolerance to the two viruses, some trees suffering noticeable defoliation followed by die-back, and others remaining apparently unharmed. That this variation is genetical was indicated by the fact that in plantings of I.C.S. clones at River Estate, differences in symptoms were greater between the clones than between trees in the same clone. Both viruses appeared to spread from tree to tree in a row; there were also individuals or pairs of infected trees indicating scattered new outbreaks. In the six-year-old field of I.C.S. clones at River Estate, over 7·8 per cent. of trees were found to be infected, suggesting an alarmingly rapid rate of spread. At present the viruses seem to be confined to the western end of the Northern Range, with the Maracas valley, in which the vein-clearing virus alone had been found, as the most easterly point; they are present, either separately or together, in every field in Santa Cruz valley, with red mottle more prevalent; and in Diego Martin red mottle predominates, though symptoms of the vein-clearing virus have been observed on a few trees.

Andrén (F.). **Några resultat från 1943 års betningsförsök met stråsäd.** [Some results of the 1943 cereal seed-grain disinfection experiments.] —*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, viii, 2, pp. 19–23, 1944.

A tabulated survey is given of the experiments conducted in Sweden in 1943 with commercial preparations for the control of cereal seed-grain diseases [cf. *R.A.M.*, xxii, p. 471]. Bunt of winter wheat [*Tilletia caries* and *T. foetida*] was most effectively combated by panogen (200 ml. per 100 kg.), followed next in order by 30 minutes' immersion in 0·125 per cent. uspulun. The data relating to rye do not permit of any very definite conclusions owing to the low incidence of fusariosis [*Calonectria graminicola*]; soaking in 0·125 per cent. uspulun gave the best results, with an average yield of 210 kg. per ha. All the fungicides tested (comprising, besides those already mentioned, U.T. 1875 b, germisan, betoxin, abavit-neu, and fusariol dusts, all at 200 gm. per 100 kg., and germisan and fusariol-neu, 0·125 per cent., 30 and 15 minutes' immersion, respectively) gave excellent control of barley stripe [*Helminthosporium gramineum*], with yield increases up to 862 kg. per ha. The best control of loose smut of oats [*Ustilago avenae*] was given by betoxin and fusariol dusts (300 gm.) and 15 minutes' immersion in 0·1 per cent. mercuric chloride-formalin, the same three preparations, especially the last-named, having been the most efficacious over the five-year period from 1939 to 1943 inclusive. In this connexion it is pointed out that *U. avenae* affords a very reliable indication of the comparative efficiency in general of seed-grain disinfectants.

On the whole, the experimental figures for 1943 are very satisfactory, the ratings assigned for the effects of treatment against wheat bunt, barley stripe, and oats loose smut being 99·5, 99·8, and 95·6 per cent., respectively, while the corresponding yield increases were computed at 12·7, 18·8, and 5·1 per cent. respectively.

Chester (K. S.). **Methods of appraising intensity and destructiveness of cereal rusts with particular reference to Russian work on Wheat leaf rust.**—*Plant Dis. Reptr, Suppl.* 146, pp. 99–121, 2 figs., 1 graph, 1944. [Mimeographed.]

This valuable survey consists of a digest and discussion of papers published by Russian workers during the past quarter of a century describing methods of improving the accuracy of estimations of the intensity and destructiveness of plant diseases. It is confined to an analysis of the techniques used in appraising the cereal rusts, and in particular, wheat leaf rust (*Puccinia triticina*). Contributions from workers outside Russia are mentioned only when they assist the reader to understand the Russian researches more readily.

Greenhouse method of testing dust seed treatments to control certain cereal smuts.—*Phytopathology*, xxxiv, 4, pp. 401–404, 1944.

Full directions are given for the testing, by recognized procedures approved by the Committee on Standardization of Fungicidal Tests, American Phytopathological Society [cf. *R.A.M.*, xxiii, p. 489], of dust seed-grain treatments for the control of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetida*], loose smut of oats (*Ustilago avenae*), and covered smut and black or shallow-borne loose smut of barley (*U. hordei* and *U. nigra*). The methods are designed primarily for the evaluation of commercial materials already on the market, and of promising new preparations given adequate preliminary trials by the originators, and not, in the first instance, for the development of new fungicides.

Woodward (R. W.) & Tingey (D. C.). **Cache, a beardless and smut-resistant winter Wheat.**—*Bull. Utah agric. Exp. Sta.* 312, 10 pp., [? 1944].

Cache (formerly designated 54a 40 or C.I. 11599), the new beardless variety of winter wheat described in this bulletin, has been developed in Utah from a cross made in 1927 between Ridit and Utah Kanred, and was distributed to farmers for trial in 1937. The new variety equals Relief and Utah Kanred in yield, but is superior to either of them in resistance to the local smuts (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetida*] and to lodging and shattering.

Dennis (R. W. G.). **Occurrence of Ophiobolus graminis var. avenae on Wheat crops in the field.**—*Ann. appl. Biol.*, xxxi, 2, pp. 100–101, 1944.

During August, 1943, examinations were made of 104 oat crops, mainly in south-western Scotland, 90 of which showed varying amounts of take-all (*Ophiobolus graminis* var. *avenae*) [*R.A.M.*, xxiii, p. 130]. The disease has now been recorded in Banffshire, Aberdeenshire, Kincardineshire, Perthshire, Fife, Peeblesshire, Dumfriesshire, Kirkcudbrightshire, Wigtownshire, and Ayrshire. As many wheat crops as possible were also examined in the area visited, special attention being paid to wheat following oats. Take-all samples were secured from 15 wheat crops, seven of which had followed oats, and these samples were tested for *O. graminis* var. *avenae* by Garrett's method [ibid., xviii, p. 172], an oat grain being inserted in the lumen of the infected straw, planting effected in a sand culture, and the seedling examined for take-all lesions. The oats used were naturally infected with *Helminthosporium avenae* and *Fusarium* spp., to about 10 and 25 per cent., respectively. As it was considered undesirable to treat the seed with an organomercury disinfectant before insertion in the straw, the results were complicated by the presence of *F.* foot rot. There was no difficulty, however, in distinguishing between take-all and *F.* foot rot, and with regard to the point that oat seedlings affected by the latter may be more susceptible than normal plants to attack by *O. graminis*, it is stated that the proportion of seedlings showing take-all lesions was far higher than could be explained in this way. It is, therefore, concluded that at least some of the take-all in all the wheat crops represented by the samples cited was due to *O. graminis* var. *avenae*. This is supported by the ascospore measurements for six samples, each of which indicated a mean length of 100 spores considerably above that of *O. graminis*.

Confirmatory results were obtained by Garrett with two additional samples of wheat straw from Dryfesdale and Morton parishes, Dumfriesshire. The former, from a wheat crop following oats and containing numerous take-all infected volunteer oats, gave positive reactions on oat seedlings; the latter, from a first crop after old grass, bore perithecia with ascospores 85 to 121 (mean 106 × 1·3) μ in length typical of *O. graminis* var. *avenae*.

Koblet (R.). **Ergebnisse und Ziele der getreidebaulichen Versuchsarbeit.** [Results and aims of experimental work in connexion with cereal cultivation.]—*Schweiz. landw. Mtsh.*, xxii, 3, pp. 57–81, 2 figs., 2 graphs, 1944.

Recent investigations on some problems of cereal cultivation, with special reference to Swiss conditions, are summarized and discussed, including Défago's work on foot rots, *Ophiobolus graminis* [*O. herpotrichus* is evidently meant] and *Cercosporella herpotrichoides* [*R.A.M.*, xx, p. 396], against which crop rotation still remains the only practicable method of control.

Blind ears in Wheat.—*Rhod. agric. J.*, xli, 3, p. 114, 1944.

In Southern Rhodesia blind ears are not uncommonly met with in wheat crops. They are found in crops making normal growth and revealing no deficiency symptoms. Such crops generally grow in patches on black sandy vlei [low-lying] soils typical of the non-irrigated granite vlei soils of the wheat belts. Soil analyses have revealed nothing to account for the condition, and no specific disease appears to be responsible. An application of 15 lb. borax per acre to land which had previously given wheat with completely blind ears resulted in a stand of approximately 100 per cent. good wheat.

Leukel (R. W.). **Spergon, arasan, and merc-o-dust ineffective for the control of Oat smut.**—*Plant Dis. Reptr*, xxvii, 25, pp. 704–706, 1943. [Mimeographed.]

When oat seed of the Colorado No. 37 variety experimentally inoculated with covered smut [*Ustilago kolleri*] was dusted with new improved ceresan, Du Bay 1452-C, spergon, arasan, and merc-o-dust (spergon and arasan being used at 1 oz. per bush. and the remainder at half this rate), and then sown, the resulting plants averaged 4, 5·5, 39·5, 40·6, and 50·6 per cent. infection, respectively, as against 48·2 per cent. for the untreated, inoculated controls.

Pichler (F.). **Zur Frage der Schneeschimmelbekämpfung.** [On the question of snow mould control.]—*Mitt. Landw., Berl.*, lviii, 36, pp. 726–727, 1943.

The damage to rye (Germany's most important cereal crop) from the snow mould [*Calonectria graminicola*] in the winter of 1941–2 is described as 'enormous'. Seed-grain disinfection alone does not give adequate control, but must be combined with rational cultural measures, i.e., use of large, heavy seeds with high germinability and vigour, of resistant varieties; rather late, sparse and shallow sowing on well-layered, firm, dry soil; omission of readily soluble nitrogenous manures from the autumn fertilizing scheme; and crop rotation. Highly satisfactory results have been obtained experimentally in the environs of Vienna by the application as a top-dressing, just before the onset of winter, of preparation 'P' (I.G. Farbenindustrie) at the rate of 50 kg. per ha., the high cost of which, however, precludes its large-scale use. The common practice of ploughing up infected stands immediately the snow melts is to be deprecated, since the surviving healthy plants, given proper care and a top-dressing, may produce quite a substantial yield in the summer.

Mukerji (B.) & Dey (N. K.). **A method for the assay of individual ergot sclerotium.**—*Curr. Sci.*, xiii, 5, p. 128, 1944.

Using Fairbairn's method for the analysis of individual ergot (*Claviceps purpurea*) sclerotia (*Pharm. J.*, 13th March, 1943), which is similar to that of Békésy [*R.A.M.*, xix, p. 94], the writers determined the alkaloid contents of the single sclerotia in a batch of material from Coimbatore, Madras [cf. ibid., xxii, p. 301], and found an average of 0·165 mg., compared with 0·145 mg. estimated by the procedure laid down in the B[ritish] P[harmacopoeia]. Individual sclerotia of the ergot on *Chrysopogon zeylanicus* in the South Indian hills gave a faint trace of alkaloids in response to Fairbairn's test, whereas *Oplismenus compositus* (also found by Padwick and

Azmatullah to be infected by *Claviceps viridis* in the Simla district) [ibid., xxiii, p. 65] gave negative results. Possibly the low alkaloidal content of grass ergots may be attributed to their parasitization by the latter species instead of *C. purpurea*, which develops medicinally valuable alkaloids in rye ovaries.

McLaughlin (J. H.). **Southern Cooperative Corn Disease Research Committee.**—*Plant Dis. Reptr*, xxviii, 3, pp. 64–76, 11 graphs, 1944. [Mimeographed.]

The results of maize disease work carried out during 1943 by the Southern Cooperative Corn Disease Research Committee, which comprises 14 workers in nine States, showed that seed treatment with semesan jr., at the rate of 3 oz. per bush. seed-grain, gave significant improvement in average seedling stands in 37·5 per cent. and highly significant improvement in 31·3 per cent. of the 16 plantings made; there were no significant differences in yield. Mesocotyls from seedlings grown from treated seed were infected with *Fusarium moniliforme* [*Gibberella fujikuroi*] and other organisms to a lesser degree than those from seedlings from untreated seed. Isolations from diseased seedling tissue yielded also *F.* sp., *Penicillium* sp., *Aspergillus* sp., *Rhizopus* sp., *Corticium* sp., *Mucor* sp., *Cephalosporium acremonium*, various bacteria, including a yellow one, *Macrophomina phaseoli* [*R.A.M.*, xxiii, p. 187], *Trichoderma* sp., *Chaetomium* sp., *Helminthosporium* sp., and *Diplodia zeae* [ibid., xxiii, p. 12]. Each of the five chemicals used in the second series of tests (semesan jr., spergon, arasan, barbak-D, and Dubay 1451-D), produced increased seedling stands in 75·5 per cent. of the total number of plots, but neither had any significant effect on yields. The *G. fujikuroi* infestation was again heavier in seedlings grown from untreated seed than in those treated with any of these dusts. A comparison of the three rates of application, $1\frac{1}{2}$, $\frac{3}{4}$, and $\frac{3}{8}$ oz. per bush. seed, of the above-mentioned five chemicals and merko, dow # 5, and amac-118·5-C, in their effect on seedling stands, revealed no significant differences between the performance of the three doses.

Standen (J. H.). **Variability of Nigrospora on Maize.**—*Iowa St. Coll. J. Sci.*, xvii, 2, pp. 263–275, 1 fig., 1943.

Two species of *Nigrospora*, *N. oryzae* and *N. sphaerica*, differing mainly in spore size, have been differentiated on maize. This study is directed to showing whether two species can be maintained for *Nigrospora* as it occurs on maize in Iowa, from its sporulation, spore size, cultural characters, and pathogenicity.

Over a four-year period the average spore diameter of nearly 400 field collections was established; they were found to vary between the 12·6 to 13·0 μ spore class and the 17·6 to 18·0 μ one. In 1939 the distribution of average spore measurements was unimodal, and consistently on the small side; in 1941 and 1942 a slight tendency towards bi-modal distribution developed.

In numerous isolates sporulation was found to vary between abundant in two days, and none at all in fourteen days. The colour of the mycelium varied from white, through various shades of grey, to black. Its appearance could be classified as low, sparse; low, compact; cottony; fluffy; or tufted.

Mass spore isolates from large-spored collections tended to reduced spore size and very varied cultural characters; those from small-spored collections tended to produce rather larger spores in culture, and were more uniform in cultural characters.

Single-spore isolates from large-spored collections which might have been passed as *N. sphaerica* were found to show a strong tendency to become small-spored in culture and in fact typical of *N. oryzae*. When these now small-spored isolates were inoculated on to unsterilized maize cobs, they remained small-spored. The author concludes that all the *Nigrospora* material on maize can properly be referred to one species, and for this he accepts the name *N. oryzae* [*R.A.M.*, xxiii, p. 339].

McDonough (E. S.). **Studies on the cytoplasm and its inclusions in Sclerospora graminicola.**—*Amer. J. Bot.*, xxx, 10, pp. 809–813, 11 figs., 1943.

Details are given of cytological studies on the mycelium, sex organs, oospores, and germinating oospores of *Sclerospora graminicola*, particularly in regard to the cytoplasm of their structures. In addition, many microchemical tests were made on ripe oospores in an attempt to identify the large central body. Because of its staining and solubility reactions the basic substance of this body is considered to be a carbohydrate or a carbohydrate-protein complex.

Lohman (M. L.) & Stokes (I. E.). **Stem anthracnose and red rot of Sorgo in Mississippi.**—*Plant Dis. Reptr*, xxviii, 3, pp. 76–80, 1944. [Mimeographed.]

A *Colletotrichum* stem rot is reported to have caused serious losses in experimental plantings of sorgho [*Sorghum saccharatum*] at the U.S. Sugar Plant Field Station, near Meridian, Mississippi, in 1940, when only a general appraisal of damage could be made, and again in 1943, when it was particularly severe in nurseries and among mid-season and late-maturing varieties and hybrids. In the latter year the highest incidence occurred in the region to the east of the northern-central belt of prolonged spring and summer drought, with advanced stages of rot and an average of 10 per cent. stem breakage in two fields in Noxubee County and one field in Lowndes County. In 1941 only the incipient stages of rot were observed, and in 1942, although infection was general, damage was very slight, affecting only late-maturing sorghos. Systematic plot surveys in 1942 and 1943 showed that the disease differs in some respects decidedly from the *C.* stem rot of broomcorn [*S. bicolor* var. *technicus*] in Illinois [*R.A.M.*, xxii, p. 475]. The causal fungus, not yet positively identified pending comparison with *C.* isolates from other grass hosts, is stated to be, culturally and morphologically, very similar to *C. falcatum*. The chief stem symptoms of the disease in sorgho are, in general, the same as those described for red rot in sugar-cane [ibid., xviii, p. 344]: internal discoloration, from yellowish or orange to red, reddish-brown, or reddish-purple, bars of mottling, cortical anthracnose, and rot, which progresses largely upwards, appearing at first watery and dull and later shrunken, dull, and dry. Anthracnose lesions may appear first on the peduncle or any stem internode, developing from mycelium in pockets and bars. The lowermost internodes near and below the soil surface are typically free from disease, and crowns and roots are normal. In 1943 rot and anthracnose symptoms were obtained following artificial infection of stems. A study of weather conditions during the red-rot years indicated that moist periods, particularly when warm, favour infection and development of rot, probably owing to a rapid increase in potential inoculum in the presence of very succulent plant tissue; when moist periods are followed by drought, conditions are not only adverse to the plants but favourable to the rapid advance of rot, which in the more susceptible varieties proceeds from all stages of infection to the point of stem breakage within a few weeks.

Bitancourt (A. A.). **Distribuição teorica de lesões em folhas ou frutas, causadas por insetos e outros animais ou por agentes infecciosos transmitidos por vetores.** [Theoretical distribution of lesions on leaves or fruits caused by insects and other animals or by infectious agents transmitted by vectors.]—*Arq. Inst. biol., S. Paulo*, xiv, 17, pp. 243–252, 1943. [English summary.]

When lesions on citrus leaves and fruits are produced by a small number of infectious agents dispersed at random over the surface, a Poisson distribution of the number of such organs with 0 to k lesions is observed. A single insect, however, among those scattered over the foliage or fruits, may produce or transmit more than one lesion, in which case the distribution can be expressed by the formula: $p_n(a+b+c+d+\ldots)^n$, where p_n is the probability of the presence of n vectors on

a given leaf or fruit, and $a, b, c, d \ldots\ldots$ the probabilities of a given insect producing 1, 2, 3, 4 . . . . . lesions per leaf or fruit. An example is given of the application of this distribution to the number of sweet orange leaves with 0 to more than five lesions of leprosis [*R.A.M.*, xxi. p. 74] among 5.000 leaves collected at random in an orchard in the State of S. Paulo.

A statistical study of the distribution of discrete virus lesions on the foliage or fruits may give a clue to the systemic or local character of the disease, Poisson's law being normally followed in the former case, while in the latter the above-mentioned formula is more likely to be applicable.

Bitancourt (A. A.) & Fawcett (H. S.). **Statistical studies of distribution of psorosis-affected trees in Citrus orchards.**—*Phytopathology*. xxxiv. 4, pp. 358–375, 1 fig., 3 diags., 1944.

This is an expanded, tabulated account of the authors' statistical studies on the distribution of sweet orange trees affected by psorosis in 14 Californian orchards, a note on which has already appeared [*R.A.M.*, xxii, p. 63]. It is concluded from the assembled data that the spontaneous formation of root grafts between diseased and healthy trees is most likely to result in (1) the high percentage of transmission that would produce variations in incidence (from 3·8 to 70·6 per cent.) of the magnitude observed, and (2) the comparatively rapid decrease in such differences with increasing distance from a central tree. While the possibility of some other means of conveyance of the virus, e.g., by insect vectors, cannot be entirely disregarded, observational evidence to date suggests that any such method of diffusion is both slow and infrequent compared with natural root-grafting.

Fawcett (H. S.). **Prevention of psorosis.** –*Calif. Citrogr.*, xxix, 7. p. 187, 1944.

Citrus psorosis [*R.A.M.*, xxiii. p. 62 and preceding abstract] can be prevented by taking buds from healthy trees and budding them on to healthy seedlings. Seeds transmit the disease only occasionally. Many budded citrus trees may have the virus without showing any bark symptoms; orange, grapefruit, and tangerine trees finally show them, but lemons do not. A system has been instituted by the State Department of Agriculture, Sacramento, by which trees intended to serve as sources of citrus buds may be inspected and registered by number, the propagator being supplied with a letter of registration to show to prospective buyers of the progeny trees. Nearly 50 per cent. of the trees selected by nurserymen and propagators for registration have been rejected, but about 1,000 trees have so far been registered.

Klotz (L. J.) & Fawcett (H. S.). **Treatment of brown rot gummosis.** –*Calif. Citrogr.*, xxix, 7, pp. 194–195, 1 fig., 1944.

During the past seven years, many old citrus trees in California that had escaped the disease for upwards of half a century became so badly attacked by brown rot gummosis [chiefly *Phytophthora parasitica* and *P. citrophthora*: *R.A.M.*, xxii, p. 132] and had so much bark killed before the disease was found that surgery could no longer save them. Growers should make a careful inspection of the trunks and crowns of their trees during spring and early summer, when gumming makes identification easy. When treatment is required the bark should be removed by the standard method [which is described], and the treated area dusted with dry Bordeaux mixture, zinc-copper-lime (also spray-dried), or tetrachloroquinone, or painted with 1 per cent. permanganate of potash solution or a water suspension of any one of the dusts mentioned. Copper-containing materials stimulate the exudation of a clear light-coloured gum, which should be ignored. The treated lesion is left to dry, and is then covered with tree seal or white lead paint.

Brooks (C.). **Stem-end rot of Oranges and factors affecting its control.**—*J. agric. Res.*, lxviii, 10, pp. 363–381, 1 fig., 2 graphs, 1944.

Stem-end rot (chiefly *Diplodia natalensis* and *Phomopsis* [*Diaporthe*] *citri* [*R.A.M.*, xxii, p. 430]) was found to be the most important cause of spoilage in Florida oranges purchased on the Washington market. A study was made from 1939 to 1942, first at Beltsville, Maryland, and later at Orlando, Florida, with naturally and artificially infected fruits. The best method of obtaining a continuous supply of spores of *D. citri* was to grow the fungus on sterilized snap beans in test tubes, while good spore production of *Diplodia natalensis* was secured on wheat grains, soaked over-night and then sterilized. The stem-end rot fungi were found to penetrate the fruit readily either through the cut on the stem or other parts of the button. *D. natalensis* produced decay in less than half the time required by *Diaporthe citri*, even at temperatures somewhat more favourable to the latter. Oranges that had been held in an ethylene room for 42 to 45 hours at 80° to 85° F. and 87 to 92 per cent. humidity had, two weeks after harvest, about nine times as much stem-end rot, almost entirely due to *Diplodia natalensis*, as similar oranges held for the same number of hours in an ordinary basement at approximately 70° and 80 to 90 per cent. humidity; after three weeks they had more than three times as much. Three possible reasons are suggested for the increased decay after ethylene treatment: the higher temperatures of the ethylene room, a possible stimulation of the germination of *D. natalensis* spores, and, most important of all, the ageing and weakening of the buttons.

Of various disinfectants tested, borax and sodium ortho-phenylphenate gave the best results, while formaldehyde, calcium and sodium hypochlorites, and sodium bisulphite showed no promise. Borax applied after ethylene was less than half as effective as when applied before, while the phenate was equally effective whether applied before or after. The phenate applied after ethylene was as effective as borax applied before ethylene during the first two weeks in storage at 70°, but became less effective after longer periods. The phenate was used as a 1·2 per cent. solution at 100° and caused no injury when application was followed by thorough washing, though increases in temperature led to injury. Generally, increased temperatures with a particular strength of phenate solution resulted in a greater increase in injury than in decay control. Nearly as good control was obtained with the 1·2 per cent. solution at 90° as at 100°. Including 1·2 per cent. of phenate in the water phase of a water-wax emulsion at 100° caused no injury and, in the few tests made, gave better control of stem-end rot than any other method of applying this fungicide.

Chapman (H. D.), Brown (S. M.), & Rayner (D. S.). **Diagnosing the fertility needs of Citrus trees.**—*Calif. Citrogr.*, xxix, 7, p. 182, 1 fig., 1944.

The principal leaf, growth, and fruit symptoms of nutrient deficiencies in citrus trees are fairly well known. The early stages of deficiency are sufficiently distinctive in the case of zinc, iron, manganese, and magnesium for these deficiencies to be positively diagnosed and corrective measures instituted before serious effects have ensued. Unfortunately, the early symptoms of nitrogen, sulphur, phosphorus, potassium, calcium, boron, and copper deficiency do not become visible in any kind of tangible leaf pattern, or in growth or fruit characteristics. The authors, therefore, examined the possibilities of detecting the early stage of such deficiencies by chemical analysis of the plant. Citrus trees are being grown out-of-doors in solution cultures with known and maintained concentrations of the various mineral nutrients, and periodical analyses are made of the various parts of the trees so treated. As leaves vary in composition according to their age, tests have to be made on leaves of known age. With oranges and grapefruit, the authors use spring-cycle leaves on fruit-bearing branches. A sample of 30 to 50 leaves picked

in a circle from waist- to shoulder-height around a citrus tree gives a representative sample. In sampling an orchard, the authors examine in this manner about ten trees in a representative area of the grove.

The evidence obtained indicates that if citrus leaves contain under 0·2 per cent. potassium on a dry basis, then potassium is probably deficient in the soil [*R.A.M.*, xxii, p. 248]. Leaves containing 1 per cent. or more potassium are amply supplied. The significance of intermediate values has not yet been determined. Most orchards showed potassium values in the leaves ranging from 0·4 to 1 per cent. The same method will be used with other elements.

Waterston (J. M.). **Citrus culture in Bermuda.**—*Bull. Dep. Agric. Bermuda* 22, 22 pp., 1 pl., 1 fig., 1944.

In Bermuda, sour orange, lemon, and grapefruit are occasionally attacked by scab (*Elsinoe fawcetti*) [*R.A.M.*, xxiii, p. 14], incidence varying greatly from year to year, according to climatic conditions. Melanose (*Diaporthe citri*) [ibid., xxii, pp. 11, 354] causes stem-end rot of the fruit, but on a smaller scale than in Florida. The West Indian or Key lime is affected by wither tip of the leaves (*Gloeosporium limetticola*) [ibid., xiii, p. 762], though the Persian or Tahiti lime and the limequats [West Indian lime × round kumquat (*Fortunella japonica*)] are immune. The West Indian lime is also attacked by anthracnose (*Colletotrichum gloeosporioides*), but the disease is greatly reduced when the trees are starved of nitrogen. Psorosis becomes apparent on established trees just about to come into bearing. Directions are given for control.

Bliss (D. E.). **Omphalia root rot of the Date Palm.** *Hilgardia*, xvi, 2, pp. 15–124, 6 pl., 31 figs., 5 diags., 9 graphs, 1 map, 1944.

A full account is given of 15 years' researches into the decline disease of date palms in the Coachella Valley, California, caused by *Omphalia pigmentata* and *O. tralucida* [*R.A.M.*, xxiii, p. 15]. Only about 1 per cent. of the total acreage given up to date is at present affected, but the disease is important economically by the threat it offers of further spread [cf. ibid., xvii, p. 29].

The typical primary symptom is a necrotic lesion usually confined to the underground portion and developing offshoots. The abortion of young roots is the worst type of injury. Secondary symptoms include premature wilt and death of the older leaves, retardation of terminal growth, reduction in size and number of fruit stalks, and the production of small, worthless fruits. Death usually occurs only in young seedling palms [cf. ibid., xiii, p. 694]. *Phoenix dactylifera* is the only naturally infected suscept, but the susceptibility of *P. canariensis* and *Washingtonia filifera* was demonstrated by artificial inoculations.

The pathogen enters the palm by direct mycelial penetration through the cuticle and the outer epidermal wall. A mat of hyphae becomes closely attached to the surface. The starch grains are dissolved from the underlying cells, which become discoloured and die. The mycelium invades the necrotic tissue and fills every cavity. The attack on the leaf bases is preliminary to the root-rot phase; the roots have to penetrate the older leaf bases covering the trunk. Latency may range from a few days to over five years.

Rapid infection occurred in soil at 24° to 38° C. The optimum soil temperature for the disease was 31° or slightly above, whereas that for terminal growth of date roots was about 24°. Potted seedling dates lived for three years in soil continuously covered with water. Continuous immersion of date roots, starting 48 hours after inoculation, prevented infection. Moderate to severe attack occurred in soil with P_H 5·11 to 9·65. The disease occurs in soils of widely different salt concentrations. It may spread in all directions from a focus of infection at a rate of 30 to 60 ft. a year. Secondary symptoms have been observed only in the Deglet Noor variety,

though *O.* spp. have been isolated from the roots of several others, which, however, show slight necrosis and no stunting of the plants.

The occurrence of the disease may be prevented by planting healthy offshoots in uninfected soil. The Khadrawy, Halawy, Iteema, Tazizaoot, Khustawy, Zahidi, and Tafazwin varieties and many seedlings appear to possess considerable tolerance. The relative resistance of seedling palms increases with age.

In soil treatments with potted date seedlings, 17 chemicals were tested, representing the hydroxides, nitrates, sulphates, and phosphates of hydrogen, potassium, ammonium, and calcium. Treatments with ammonium compounds resulted in the lowest percentage of aborted roots and those with the calcium compounds in the highest. The nitrates as a group gave the most effective control and the phosphates the least. In one garden, many affected palms improved after heavy applications of water and fertilizer, but severely infected palms showed no sign of recovery as a result of improved cultural methods. In preliminary experiments, carbon disulphide, chloropicrin, and ethylene oxide gave encouraging results. All killed the pathogen, and all stimulated growth of cauliflower seedlings planted 30 to 46 days after treatment to test the effect of the chemicals on the soil. Under field conditions, carbon disulphide was the most satisfactory material tested.

Rogers (C. H.). **Cotton seed-treatment studies at the Blackland Experiment Station.**—*Bull. Tex. agric. Exp. Sta.* 634, 22 pp., 6 figs., 1943.

The two most important seedling diseases of cotton under Texas conditions are stated to be angular leaf spot (*Bacterium* [*Xanthomonas*] *malvacearum*) and sore shin (usually associated with *Rhizoctonia* [*Corticium*] *solani*, although other organisms may be present). Control of these diseases was achieved in varying degrees in the course of trials conducted at the Blackland Experiment Station, Temple, Texas, from 1938 to 1942 (some data are also given for 1932) by treating cotton seed with fungicides, or delinting, or a combination of both [*R.A.M.*, xxii, p. 478]. Seed treatment was found to increase the emergence of seedlings in about 75 per cent. of the trials, to reduce seedling infection with angular leaf spot in almost every instance, and to increase the yield of seed cotton in about 75 per cent. A decrease in yield occurred in 15 per cent., while in about 10 per cent. of the trials the treatment was without effect. Fungicides were more effective on fuzzy seed than on delinted seed. No one fungicide was consistently superior to another, and the amounts used could be varied within fairly wide limits without reducing the effectiveness of the treatment. The most satisfactory materials were 2 per cent. ceresan and 5 per cent. new improved ceresan, cuprocide, cyanamide 154–6–B, and spergon. Fungicidal dusts containing insoluble copper compounds appeared to offer promise in the treatment of cotton seed for planting in alkaline blackland soil. All methods of delinting gave good control, but in some cases the results were further improved by an additional fungicidal dust treatment. South-eastern-grown seed was found to develop much less angular leaf spot in the seedling stage (not more than 5·2 per cent.) than Texas-grown seed (up to 92 per cent.); seed treatment was, therefore, most beneficial when locally grown seed was used. The results were not improved by supplementing the fungicidal dust treatment with indole butyric acid. Separation of the seed according to specific gravity showed no consistent differences in stand or yield between the different fractions. Seed treatment was most effective where low rates of seeding were used (two seeds per hill as against five or ten); conversely less seed would be required when treated seed is used. As the cost of treatment is only 5 to 10 cents per bush. of seed, it is considered that any increase in yield would justify the slight expense.

Fawcett (H. S.). **Fungus and bacterial diseases of insects as factors in biological control.**—*Bot. Rev.*, x, 6, pp. 327–348, 1944.

Experimental work on entomogenous parasites in relation to the biological

control of plant pests is still in a very rudimentary stage, partly perhaps on account of the intermediate position occupied by the subject between the fields of the entomologist and the plant pathologist. In the present paper the author summarizes some outstanding contributions to the knowledge of this means of combating insects, mostly those infesting citrus [*R.A.M.*, xxiii, p. 17], the results of which lead to the conclusion that further co-operative research in the largely unexplored field would well repay the necessary efforts. In this connexion it is necessary not only to determine the role of entomogenous parasites in natural control, but also to study methods of enhancing their efficiency by artificial spread under conditions where spontaneous infection does not suffice to check the activities of the pests. A bibliography of 90 titles is appended.

Jensen (H. L.). **Microbiological investigations on the dew-retting of Flax.** —*Proc. Linn. Soc. N.S.W.*, lxvi, 5 6, pp. 276 286, 1 pl., 2 graphs, 1941. [Received August, 1944.]

The information in this paper has already been noticed from another source [*R.A.M.*, xxi, p. 370].

Bickerton (J. M.). **Alternaria blight of Carnations caused by Alternaria dianthi Stev. and Hall.** —*Bull. Cornell agric. exp. Sta.* 790, 29 pp. 5 figs., 1943.

In investigations carried out by the author on carnation blight (*Alternaria dianthi*) [*R.A.M.*, xxii, p. 388] inoculation studies extended the suscept range of the fungus to include *Dianthus plumarius*, *D. chinensis* var. *heddewigii*, and × *D. allwoodii*. All varieties of *D. caryophyllus* were found to be about equally susceptible, though under natural conditions some are more consistently affected than others.

Infected cuttings are the chief source of inoculum for primary and secondary infections in the cutting bench. Similarly, the various chains of secondary lesions in the greenhouse and field are initiated by conidia developing on already existing lesions. The conidia are spread chiefly by water. Stomata and wounds represent the infection courts for leaf infections. Stem cankers on young plants and plant parts are initiated at the nodes by the continued expansion of a leaf lesion into the stem, the coalescence of stem lesions on uninjured tissue, or the growth of the fungus into wounds on the stem. Cankers on woody stems would appear to arise by one or other of these means before the stem becomes woody, or through cracks or mechanical injuries in the woody tissue. The conidia germinate at temperatures ranging from 37° to 88° F.; the optimum range is 64° to 81°, with a peak at about 75°. In this optimum range most of the spores germinated in eight hours. In inoculation tests, the optimum temperature for infection was about 70°. It would appear that, for infection to take place between 60° and 80°, moisture must be in contact with the conidia for at least eight to ten hours. At lower temperatures, longer wetting is necessary. The amount of infection increased in proportion to the period of wetting of the leaf surfaces, apparently owing to the proportionate increase in the number of spores that developed.

At temperatures from 67° to 81° the incubation period for stomatal leaf infections was about 28 hours, being proportionately longer at higher or lower temperatures. In the optimum temperature range, foliage symptoms associated with stem cankers appeared 10 to 60 days after inoculation.

Plants kept in the greenhouse during the summer remain almost unaffected even if they are not sprayed, and in a wet season may produce more than twice as many flowers as plants grown in the field. The severity of the disease on field-grown plants is reduced by benching early. Overhead watering in the greenhouse greatly assists in the spread of infection.

In the field, spraying with Bordeaux mixture (4 4 50) plus penetrol (1 in 600)

or raw linseed oil (1 in 400) reduces infection and increases flower production. Applications should be made either before rains or at 10-day intervals, beginning shortly after transplanting to the field and continuing until just before benching.

Campi (Maria D.). **'Heterosporium echinulatum' (Berk.) Cke, nuevo parásito del Clavel Dianthus caryophyllus en la República Argentina.** [*Heterosporium echinulatum* (Berk.) Cke, a new parasite of the Carnation, *Dianthus caryophyllus*, in the Argentine Republic.]—*Lilloa Rev. Bot. Tucumán*, viii, 1, pp. 269–271, 1 pl., 1 fig., 1942. [English summary. Received June, 1944.]

Heterosporium echinulatum [*Didymellina dianthi*] was observed, for the first time in Argentina, attacking glasshouse carnations [*R.A.M.*, x, p. 297; xvi, p. 506] in Buenos Aires in July, 1940, and has since been recorded from other localities in the same Province. The fungus produces on the leaves, skin, and calyx, pale ochraceous spots surrounded by a blackish-purple to dusky violet halo (Ridgway). The echinulate, subcylindrical, bi-to-quadriseptate, brown-olive spores are borne on erect, slender, septate, nodose conidiophores and measure on an average 27 to 60 by 9 to 12 (average 42·3 by 14·7)μ. Inoculation experiments with pure cultures from potato dextrose, maize meal, or oatmeal agar gave positive results only in an atmosphere saturated with moisture.

Middleton (J. T.), Tucker (C. M.), & Tompkins (C. M.). **A disease of Gloxinia caused by Phytophthora cryptogea.**—*J. agric. Res.*, lxviii, 11, pp. 405–413, 4 figs., 1944.

This is a full account of the disease of glasshouse *Gloxinia* (*Sinningia speciosa*) due to *Phytophthora cryptogea* in California, a preliminary description of which has already been noticed [*R.A.M.*, xviii, p. 316]. The disease is stated to be of economic importance, causing a considerable loss of plants. A study of the causal fungus showed that the minimum temperature for mycelial growth is below 1° C., the optimum between 22° and 25°, and the maximum between 31° and 34°. All isolates of the fungus from *Gloxinia* proved pathogenic to healthy plants. The incubation period ranged from 14 to 28 days for seedlings, but all infected plants died within two to six days of commencing to wilt. For corms the incubation period was usually 18 to 35 days. Of 435 plants inoculated, none escaped infection, while all the controls remained healthy. The pathogen was re-isolated and proved pathogenic on re-testing. It was also able to infect a number of Gesneriaceae, and also *Cineraria* (*Senecio cruenta*), cockscomb (*Celosia argentea* var. *cristata*), and slipperwort (*Calceolaria crenatifolia*), besides 15 other newly reported hosts. Annual stock (*Matthiola incana* var. *annua*), *S. cruenta*, and Transvaal daisy (*Gerbera jamesoni* var. *transvaalensis*), are more susceptible to attack than China aster, *Celosia argentea* var. *cristata*, *Godetia*, *Gloxinia*, and *Calceolaria crenatiflora*. There was evidence that some isolates have a wider host range than others.

Kreitlow (K. W.) & Myers (W. M.). **Prevalence and distribution of stripe smut of Poa pratensis in some pastures of Pennsylvania.**—*Phytopathology*, xxxiv, 4, pp. 411–415, 1944.

Stripe smut (*Ustilago striiformis*) was detected in amounts ranging from 0·5 to 11·4 per cent. in *Poa pratensis* plants in sod plugs collected from 13 representative Pennsylvanian pastures in 1942 [*R.A.M.*, xxiii, p. 110]. The plugs from each pasture were maintained separately and observed at intervals: in most lots there was an apparent increase in the incidence of infection, reaching a maximum of 34·4 per cent. of the plugs after five months and attributed to the development of symptoms among plants showing no sign of disease at the time of collection, and to the presence of the fungus in a dormant state. In some pastures infection was

fairly evenly distributed over the entire field, while in others the amounts varied in different areas.

Müller (K. R.). **Zum Auftreten der Luzernewelke in der Provinz Sachsen.** [On the appearance of Lucerne wilt in the Province of Saxony.]—*Mitt. Landw., Berl.*, lviii, 32, p. 641, 1943.

A species of *Fusarium* is reported from 11 out of the 28 districts of Saxony administered by the Halle Plant Protection Station to be causing severe damage to the valuable lucerne crop, up to 80 per cent. of the fields inspected being involved and containing up to 50 per cent. diseased plants. The symptoms of the wilt are identical with those attributed in the United States to *F. oxysporum* var. *medicaginis* [*R.A.M.*, viii, p. 247; ix, p. 531].

Plank (R.). **Zur Theorie von Kaltlagerkrankheiten von Früchten.** [A contribution to the theory of cold storage diseases of fruits.]—*Planta*, xxxiii, 5, pp. 728-730, 3 graphs, 1943.

In a previous paper the writer expounded his theory of the pathological phenomena associated with the cold storage of fruits sensitive to low temperatures [*R.A.M.*, xxii, p. 69]. The observed facts that the percentage of diseased fruits first increases with falling storage temperatures, reaches a maximum, and then declines as the atmosphere becomes still colder, are explicable on the basis of a disturbance in the normal biochemical processes due to the variable degree of delay in concatenated chemical reactions (cell toxin production and respiration) in the lower temperature ranges. The case of physiological breakdown in Monarch plums described by W. H. Smith from England [ibid., xix, p. 105], though more complicated, is not irreconcilable with the hypothesis here presented.

Reeves (E. L.). **Virus diseases of fruit trees in Washington.**—*Bull. Wash. St. Dep. Agric.* 1, 25 pp., 19 figs. (12 col.), 1943.

This is a summary of all available knowledge on the virus diseases of fruit trees in Washington, based on investigations and data obtained during the past ten years. Symptoms are described in popular terms and illustrated, and notes are given on control of the following diseases: mottle leaf, rusty mottle, twisted leaf, and rasp leaf of sweet cherry; pink fruit of sour cherry; western X-disease and wart of peaches; ring pox or ring spot of apricots; stony pit of pears; and mosaic of apples. Descriptions are also given of some disorders of unknown origin, often confused with virus diseases, such as crinkle and deep suture of sweet cherries and others.

The control recommendations given are admittedly tentative. No virus disease of fruit trees has been completely eradicated by tree-removal methods, but several outstanding examples are known from other States of effective economic control achieved by these methods. The success of the control programme rests upon repeated seasonal inspections, the recognition of the disease from visible symptoms, and the immediate removal of all possible sources of infection. By prompt removal and replanting of trees found affected with peach yellows, orchards have been saved for commercial production, while it is known that in the past, failure to apply these measures has often resulted in the final destruction of the whole planting. The practical value of the tree-removal method ultimately depends on such factors as the number of infected plants involved, host reservoirs of the disease, the rate of spread, and many other economic considerations. With regard to western X-disease of peach, it is pointed out that there is as yet no evidence of a definite relationship between the spread of this disease and the occurrence of the western species of chokecherry (*Prunus virginiana* var. *demissa*). The use of varieties tolerant of viruses is recommended only for certain diseases and under certain conditions, as

they represent a potential source of infection. The Lambert cherry, tolerant of mottle leaf, proved capable of producing good commercial crops in certain foothills and canyon districts of north-central Washington, where the Bing variety was seriously affected; the Bartlett pear was found to be tolerant of the stony pit virus.

Coe (D. M.). **Report of the 1942 stone fruit virus disease survey in Washington.**—*Bull. Wash. St. Dep. Agric.* 2, 19 pp., 1 graph, 2 maps, 1943.

The stone fruit virus disease [see preceding abstract] survey conducted by the Washington State Department of Agriculture during the summer of 1942 covered a total of 160,223 sweet cherry trees on 1,062 properties, 17,117 sour cherry trees on 50, and 460,071 peach trees on 829. A total of 8,830 (5·5 per cent.) of the sweet cherries was found to be diseased; of these, 1,963 had mottle leaf, 341 rusty mottle, and 6,526 crinkle and deep suture. A total of 360 (2 per cent.) of the sour cherries had pink fruit, and 8,286 (1·8 per cent.) of the peach trees had western X-disease. Twisted leaf, a virus disease of sweet cherries, was reported for the first time in the State.

The survey established a low average percentage of infection for the whole of the State, but losses were more considerable in particular orchards or zones. Loss of commercial production increases progressively with the length of time a tree has been affected. The relationship of crop loss to percentage infection in any orchard varies with the specific disease present. Thus, sweet cherry orchards with 10 per cent. mottle leaf or rusty mottle are likely to sustain a greater reduction in yield than those with the corresponding amount of crinkle or deep suture. The greatest loss to the industry occurs through the spread of virus diseases, which renders an increasing number of trees unprofitable. This spread may be rapid, and is in some cases influenced by the prevalence of wild hosts in the neighbourhood. Thus, a greater incidence of mottle leaf was noticed in sweet cherry orchards close to the wild bitter cherry. Western X-disease was observed to spread more rapidly in some orchards than in others. The spread of these diseases is also probably influenced by the seasonal abundance of their as yet unknown vectors. At the present level of virus disease infection in most of the State, the removal of diseased trees and their replacement with young, healthy ones is considered both practical and advisable. Even in orchards where disease incidence is much higher than the average and the removal of trees presents a more difficult problem, it is thought that the large initial loss of trees for a few years following tree removal is preferable to the gradually increasing losses from year to year which would occur if no measures were applied. Great care should be taken to select healthy budding or grafting wood, eliminating all with masked symptoms, as the use of buds from such tolerant trees has, in many cases, been responsible for establishing infections in disease-free orchards.

Carrera (C. J. M.). **Especies de Fusarium que causan podredumbre en los frutos de carozo.** [Species of *Fusarium* which cause decay of stone fruits.]—*Lilloa Rev. Bot. Tucumán*, v, 2, pp. 169–180, 3 pl., 1940. [German summary. Received June, 1944.]

Following a survey of previous investigations in the United States and Europe on the decay of stone fruits by *Fusarium* spp., the author describes his inoculation experiments with cultures of *F. solani*, *F. avenaceum*, *F. orthoceras*, *F. poae*, and *F. lateritium* [source not stated] on peach, cherry, plum, and apricot, the type of rot induced by each species on the several fruits being shown in tabular form.

Another object of the study was the determination of the enzymatic properties of the various species, which were as follows: *F. poae* secretes emulsin and protease; *F. solani* peroxidase, amylase, pectinase, lipase, and protease; *F. avenaceum* amylase, pectinase, and protease; *F. orthoceras* peroxidase, amylase, pectinase,

emulsin, and protease; and *F. lateritium* lipase and protease. At the end of 80 days all the species were found to have liquefied the gelatine in the bean and potato decoctions to a depth of at least 25 mm.

Green (D. E.). **Weather injuries to fruit.**—*J.R. hort. Soc.*, lxix, 6, pp. 175–178, 4 figs. (3 between pp. xxxiv and xxxv), 1944.

Some typical symptoms of certain injuries to fruit trees resulting from adverse climatic conditions in Great Britain are described, namely, frost damage to apple bark, apple and stone fruit blossoms, and apple fruits; sun scald of apple and stone fruits, including plums, the Cox's Emperor variety of which was affected in Surrey, Kent, and Worcestershire in 1943; and hail injury to apples and plums.

Singh (U. B.). **Control of fruit diseases in Kumaun.**—*Indian Frng.* iv, 8, pp. 411–412, 1943.

In these notes on fruit diseases at Kumaun, United Provinces, India, the author states that over 60 per cent. of the apple trees are affected by stem-black (*Coniothecium chomatosporum*) [*R.A.M.*, xxi, p. 531]. The fungus usually kills the thick branches, and as infection is present in all the local orchards, the loss suffered by growers must be considerable. The disease appears towards the middle of July and reaches its maximum virulence by the middle of August. It always starts from pruned surfaces and spreads downwards, producing a jet-black streak; this slowly extends and surrounds the entire branch, which cankers and dies. Stem-brown disease (*Botryosphaeria ribis*) [loc. cit.] affects 10 to 15 per cent. of apple twigs and stems. As both fungi remain hidden in the tissues, surface spraying and dusting are ineffective. Careful pruning of the affected parts at least 6 in. from the last point of infection is the only way to control these diseases once they have become established. Prevention consists in painting every cut surface with a paste made of red lead and copper carbonate in lanoline (2 : 2 : 2½ oz.).

Pink disease (*Corticium salmonicolor*) attacks the thick branches of apples, pears, and apricots. The commonest seat of infection is the fork of the branches, but the disease sometimes starts from cut surfaces also. Spread largely depends on conditions of shade and moisture, and the fungus is not virulent at the beginning of September. The following control measures are recommended: (1) painting the cut surface with the red lead, copper carbonate, and lanoline mixture; (2) painting the fork of the trees with red lead and copper carbonate in raw linseed oil (2 : 2 : 2½ oz.) before the monsoon; (3) cutting away affected branches 2 ft. below the edge of infection and burning them; (4) avoiding loamy and sandy soils for planting.

Sooty blotch and fly speck of apples (*Leptothyrium pomi*) [ibid., xxi, p. 145] may be controlled by (1) spraying with lime-sulphur (1 to 40) at open cluster stage, at petal-fall, at fruit formation, and again at fruit maturity; (2) thinning so as to leave two fruits per cu. ft. of the volume of the tree; (3) dipping the picked fruits for one minute in a 5 per cent. solution of bleaching powder or a 3 per cent. solution of sodium chlorate and then drying in air for 10 minutes, washing in tap water, and drying.

Directions are also given for the control of the storage soft rot of apples caused by *Penicillium expansum* [ibid., xxi, p. 458].

Sun scald of the trunk and branches of peaches, apricots, plums, and chestnuts produces deep longitudinal cankers. It can be controlled by tying straw round the parts affected, or likely to become affected.

Dunegan (J. C.). **Further results with metal dialkyl dithiocarbamates for the control of Apple blotch fungus.** *Plant Dis. Reptr.* xxviii. 4–5, pp. 162–163, 1944. [Mimeographed.]

The spraying of Ben Davis apple trees near Fayetteville, Arkansas, seven times

during 1943 with ferric dimethyl dithiocarbamate, or lead dimethyl dithiocarbamate, at the rate of 2 lb. to 100 gals. in both cases, again resulted in satisfactory control of apple blotch (*Phyllosticta solitaria*) [*R.A.M.*, xxii, p. 488], the percentage of infected fruit in the sprayed blocks (four to each treatment) amounting to 0·2, 4·5, 0·1, and 0·07 and 4·3, 1·8, 0·2, and 0·1, respectively, compared with 39·6, 40·7, 3·1, and 9·9, in the controls.

Smith (M. A.). **Blister spot, a bacterial disease of Apple.**—*J. agric. Res.*, lxviii, 7, pp. 269–298, 6 figs., 1944.

This is the account of a detailed study of blister spot disease of apples, first discovered in Missouri in 1916, later attributed to *Pseudomonas papulans* [*R.A.M.*, xiii, p. 384], and since found in Arkansas, Indiana, Pennsylvania, Virginia, and Illinois, but nowhere outside the United States. Under natural conditions the disease was found only on apple fruits, causing, in early June, a blister spot surrounded by a water-soaked area, often around the lenticels. The lesion is at first light in colour and may extend 0·2 to 0·4 mm. below the cuticle. Immediately below the lesion a phellogen layer, from three to five cells thick, develops. The bacteria are present throughout the region of papules. The disease is most conspicuous at this early stage and may be confused by the unaided eye with the minute infections caused by *Venturia inaequalis*. Later, the epidermis over the blister spot becomes dark and dies and often cracks loose from the surrounding healthy tissue. Although an apparent increase in the number of varieties affected was observed during the last two years in Missouri, suggesting a possible increase in severity of infection at some future time, at present the disease is considered to be of minor importance and the causal organism a weak parasite.

Positive results were obtained in inoculations of wounded and unwounded immature apple fruits in the field; of wounded immature apple, plum, cherry, and tomato fruits in moist chambers, twigs of apple, cherry, pear, plum, and lilac, and leaves of apple, peach, magnolia, and lilac. Needle-puncture inoculations of apple fruits and twigs with the lilac blight organism, *Phytomonas* [*Pseudomonas*] *syringae* [ibid., xiv, p. 319], were successful. An isolate from an undescribed leaf spot of ×*Magnolia soulangeana* proved pathogenic to apple fruits and twigs and to lilac and magnolia leaves. Negative results were obtained in apple fruits and twigs inoculated with two isolates from target canker of apple, and in apple leaves, twigs, and fruits inoculated with an isolate from an undescribed leaf spot of Rome Beauty apples.

The blister-spot organism was found incapable of survival on apple fruits placed outdoors after 15th March, indicating that blister spots on overwintered fruits are unlikely to constitute a source of infection in the spring.

A morphological and physiological study of 18 isolates of the blister spot bacterium, three of *P. syringae*, two from apple target cankers, one from *Magnolia*, and one from Rome Beauty apples revealed a close resemblance between the first two organisms and the *Magnolia* isolates, while the others appeared to be unrelated organisms. These observations were further substantiated by the results of a study of the cultural characters of the various isolates on solid and liquid media, and of their biochemical reactions and fermentation ability, using 31 carbon sources.

It is concluded that the blister spot organism, because of its morphological, cultural, physiological, and pathogenic similarity to *P. syringae*, should not retain specific rank, but be considered a variety of this species. It is designated *Phytomonas* (or *Pseudomonas*) *syringae papulans* n. var. and an emended technical description [in English only] is given. The isolate from magnolia is considered to be *P. syringae* and accordingly magnolia is regarded as an additional host of this pathogen.

Wilcox (R. B.). **Fermate spray for controlling Cranberry field rots.** - *Plant Dis. Reptr*, xxviii, 1, pp. 34–35, 1944. [Mimeographed.]

In preliminary tests carried out in New Jersey in 1943, cranberry plots were sprayed with fermate, 3 lb. per 100 gals., at the rate of 300 gals. per acre, five times during the summer at fortnightly intervals, except for the last application, which was delayed for another week. This treatment gave a highly significant reduction in the amount of field rot (known to be chiefly caused by *Guignardia vaccinii* and *Acanthorhynchus vaccinii*) [*R.A.M.*, xv, p. 817] and a similarly significant increase in the yield of sound fruit. The respective figures were 5·13 per cent. rotten berries and 51·7 barrels per acre of sound fruit harvested for fermate-sprayed plots as against 89·53 per cent. and 4·3 barrels per acre for the unsprayed, and 58·36 per cent. and 18 barrels per acre for those sprayed with Bordeaux (4–4–50). Spraying with Bordeaux thus gave approximately 35 per cent. control of field rot, while fermate gave 94 per cent. It is stated that Bordeaux is generally effective only under conditions of a light or moderate spore load, and that in New Jersey bogs, where the spore load is frequently excessive, the first-season spraying with Bordeaux is found merely to reduce the rot, full control being achieved only after two or three successive seasons of treatment, or in certain places never. In the present trials, plant growth at the end of the season was better in plots sprayed with fermate than in those sprayed with Bordeaux, and the fruit was definitely larger in the former. Further advantages of fermate were absence of blossom damage from spraying in full bloom and even increased set of fruit, and complete absence of visible residue on the harvested fruit.

Darrow (G. M.), Wilcox (R. B.), & Beckwith (C. S.). **Blueberry growing.** - *Fmrs' Bull. U.S. Dep. Agric.* 1951, ii+38 pp., 22 figs., 1 map, 1944.

In the section of this bulletin (pp. 29–38) dealing with diseases and pests of cultivated blueberries (*Vaccinium* spp.) in the United States, brief, popular notes are given on the symptoms and control of stunt [*R.A.M.*, xxi, p. 496], mummy berry (*Sclerotinia vaccinii*) [cf. ibid., iv, p. 610], twig blight (*Phomopsis vaccinii*) [ibid., xix, p. 550; xxii, p. 489], stem canker (*Physalospora corticis*) [ibid., xxii, p. 214], powdery mildew (*Microsphaera alni*) [ibid., xxii, p. 489], and 'double spot', a serious leaf disease of fungal origin, the exact cause of which has not yet been determined.

Lucas (G. B.), Chilton (S. J. P.), & Edgerton (C. W.). **Genetics of Glomerella. I. Studies on the behavior of certain strains.** - *Amer. J. Bot.*, xxxi, 4, pp. 229–233, 21 figs., 1944.

In this study of ascogenous cultures of unidentified species of *Glomerella* [*R.A.M.*, xxi, pp. 145, 425] from five different hosts (an unidentified wild species of *Ipomoea*, *Hibiscus esculentus*, *Pueraria thunbergiana*, chilli, and apple), carried out at Baton Rouge, Louisiana, from 1940 to 1943, the minus strain of each culture was easily obtained by isolating ascospores. A large number of ascospore isolations of the plus strain (the one commonly obtained in culture) developed into strains different from either the plus or the minus. Thus, from a single ascospore culture originally isolated from *Ipomoea*, seven distinct strains including the ordinary plus and minus of Edgerton, were obtained. Furthermore, in some of the original cultures from different hosts sectors occasionally developed which were similar to some of these new strains. Some of the sector strains differed from the parent in regard to the presence or absence of perithecia, normal ascospores, and conidia, and also in the shape of the conidia. The new strains are named the new plus, with fewer and smaller perithecial clumps, the fertile minus, differing from the minus in the production of numerous asci and ascospores, the heavy conidial, the small conidial, and the sterile. In making ascospore isolations of the plus strain it was

found that an ascus usually contains either four ascospores of the plus and four of the minus strain or else eight of the minus strain. There was some evidence that the asci in a single perithecium are usually alike in regard to the ratio of the different strains in an ascus, indicating that the constitution of an ascus is usually determined early and prior to the formation of ascogenous hyphae. From ascospore isolations of the minus strain, only colonies of the minus strain were obtained; and from those of the fertile minus, only such of the fertile minus. When planted in the same plate, a ridge of well-developed perithecia formed very rapidly on the line of contact between the plus and the minus, and between the plus and the fertile minus strains; and slowly with some of the other combinations. However, no such ridge developed when the strains came from different hosts.

FREAR (D. E. H.). **Deposition and retention of sprays. III. Apparatus and methods for laboratory spraying.** *Bull. Pa St. Coll.* 463, 18 pp., 3 figs., 1 diag., 7 graphs, 1944.

A description is given of an apparatus for laboratory studies of the deposition and retention of sprays [*R.A.M.*, xxiii, p. 70], constructed, and now in use, at the Pennsylvania State College as a result of trials by a number of workers over a period of about eight years. It consists of a motor-driven rotating circular turntable connected with an atomizer type of sprayer fitted with an overhead reservoir containing the spray suspension. The synthetic surfaces to be tested (cellulose nitrate sheets, commercially available as Pyralin, proved the most suitable) are attached to the turntable, sprayed for a required length of time, dried, removed, and the deposit analysed. When a series of Pyralin plates were sprayed at different air pressures with a suspension of 3 lb. of Bordeaux per 100 gals. for three revolutions of the turntable, it was found that the amount of toxicant deposited on the plates increased steadily up to and including 80 lb. per sq. in. air pressure, and then decreased at 100 lb. pressure. Consequently, 80 lb. pressure was selected as standard for all later experiments. Increases in concentration of the spray were followed by consistent increases in the amounts deposited, although the response was not linear. Using the revolutions of the turntable as a measure of time, it was shown that the amount of deposit increased regularly up to six revolutions, after which the droplets grow so large that they run off, and beyond this point the amount of deposit becomes variable. To study the retention of spray, Pyralin plates may be sprayed with the desired concentration, allowed to dry, then sprayed and washed with water, and analysed.

MILES (H. W.). **A national advisory service for agriculture and horticulture.**—*Nature, Lond.*, cliii, 3890, pp. 611–613, 1944.

The author discusses the findings and proposals contained in the report of the Luxmoore Committee [*R.A.M.*, xxii, p. 208], appointed in 1941 'to examine the present system of agricultural education in England and Wales, and to make recommendations for improving and developing it after the war', and mentions some of the criticisms advanced at a recent meeting of the Association of Applied Biology, where the report received critical examination.

HAENSELER (C. M.). **Standardization of plant disease surveys.** *Plant Dis. Reptr*, xxviii, 2, pp. 38–41, 1944. [Mimeographed.]

In this paper, read at a Round Table Conference sponsored by the 'Plant Disease Survey Sub-Committee' and held at the Columbus (Ohio) meeting of the American Phytopathological Society in December, 1943, the author proposes that plant disease surveys should be made with some specific objective in mind rather than in a random, general manner; that a survey method should be selected adapted to the specific problem in hand; that a sufficiently large area should be

surveyed to make correlation and interpretation of the data possible; and that estimates of crop losses should be expressed in terms of disease incidence and effect on crop yield or quality rather than of money. It is suggested that survey methods should be tested co-operatively, as in England [*R.A.M.*, xxii, p. 365], by several workers, before any is adopted as the official standard method. The adoption of official standard methods would greatly increase the value of the survey data obtained.

Hellyer (A. G. L.). **Garden pest control.** 120 pp., 31 pl., London, W. H. & L. Collingridge, Ltd., 1944. 7*s*. 6*d*. net.

This is a useful, popular book on the pests and diseases of garden crops. The first section is a general survey of the situation; the second lists the foes under their common names, with notes on symptoms, hosts, and control; the third tabulates the host plants with symptoms for identifying the pathogen; the fourth gives plant-protectives with directions for use; the fifth comprises a calendar of control measures; and a final section consists of 165 photographic illustrations to assist diagnosis.

Ramsbottom (J.). **Fungi and modern affairs.** *Nature, Lond.*, cliii, 3891, pp. 636-641, 1944.

This paper represents the substance of three lectures delivered by the author at the Royal Institution on 15th, 22nd, and 29th February, 1944. In a stimulating and comprehensive manner the author covers the entire field of applied mycology, dwelling on the importance of fungi in food economy, crop production, building and housing, medicine, and industry [cf. *R.A.M.*, xvi, p. 112].

Snow (D.), Crichton (M. H. G.), & Wright (N. C.). **Mould deterioration of feeding stuffs in relation to humidity of storage. Part I. The growth of moulds at low humidities. Part II. The water up-take of feeding stuffs at different humidities.** *Ann. appl. Biol.*, xxxi, 2, pp. 102-110; 111-116, 1 pl., 11 graphs, 1944.

In the first of these papers, a full account is given of an experiment in which observations were made on the development of mould growth on linseed cake, bone meal, oats, Scotch beans, bran, and locust beans [*Ceratonia siliqua*] stored for periods extending over about 3½ years in order to determine the relationship between humidity, moisture content, and the onset of moulding. The materials were spread in thin layers in small Petri dishes placed on glass tripods and were exposed in separate ground-glass stoppered museum jars sealed with vaseline to atmospheres ranging from 100 to 60 per cent. relative humidity. Humidity was controlled by sulphuric acid solutions, the specific gravity of which remained unchanged. All samples were stored at laboratory temperature. The temperature variations never exceeded 10° C. The dishes were weighed daily until the moisture content-relative humidity equilibrium was established, and examined periodically for mould mycelium and mould fructification. The number of days before the development of these stages of deterioration was rated for each sample stored at the different humidities.

The data obtained showed that the main factors controlling mould growth were the relative humidity rather than the moisture content of the feed, length of storage period, balance and type of nutrients in the food, storage temperature, and type of mould present. Mould growth took place relatively quickly on all feeds stored at 100 to 75 per cent. relative humidity. Below 75 per cent. r.h. mould growth developed only after a very prolonged latent period. Mould development was observed on locust beans exposed to a humidity as low as 65 per cent. after a latent period of more than two years. The balance and type of nutrients provided by the feeds were found to influence both the latent period and the extent of mould

deterioration. Mould growth developed earlier on samples stored at 22° than on others stored at 15·5°. At high humidities all mould species grew rapidly, whereas at low ones only a few were capable of growth. *Aspergillus repens* was the most ubiquitous species, and was able to germinate on some materials at r.h. 67.

In the second paper details are given of an investigation of the water uptake of a wide range of feeding stuffs corresponding to a range of fixed humidities. From the data obtained, the maximum moisture content for the safe storage of each individual feed was calculated. The samples were exposed to a range of humidities between 40 and 100 per cent. and were weighed daily until equilibrium had been established. Equilibrium was obtained with all samples except those exposed to 90 and 100 per cent. r.h., in which moulding intervened.

It was ascertained that the level and shape of the water curves were closely related to the amounts of soluble carbohydrate and protein present. Fibre had a depressing effect on water uptake, the value for which was also reduced by the presence of inert fats and non-hygroscopic ash constituents.

The results of these tests have made it possible to lay down safe limits of percentage water content for both short and long period storage, below which mould growth will not normally occur. These limits vary for each individual material; taken in categories, they are, for short and long periods, respectively: cereals and their by-products, 14·4 to 15·7 and 12·8 to 14·6; legumes (peas and various beans), 13·3 to 15·1 and 11·3 to 13·7; oil cakes, 11·5 to 15·1 and 11·3 to 13·3; miscellaneous feeds, including straw, hay, blood fibrinogen, fish and bone meals, 9·5 (bone meal) to 15·3 (malt culms) and 8·4 (bone meal) to 12·9 (blood fibrinogen). Details are given in tabular form.

LEVITON (A.). **A simplified laboratory check valve and its application in the construction of anaerobic culture tubes.** *Science*, N.S., xcix, 2579, pp. 455-456, 1 fig., 1944.

The author describes an inexpensive and easily assembled check valve for anaerobic culture tubes, consisting, briefly, in a cotton or glass wool plug fitted into a constriction near the mouth of the tube, mercury being floated over this plug to a depth of at least $\frac{1}{4}$ in., and a second cotton plug inserted above the mercury to prevent spattering. The valve will not permit the passage of air into the tube, but will relieve the slightest pressure of gas within. The tubes have a narrower side-arm bent at right angles and provided with a second check valve. Inert gas can be introduced through the smaller tube and allowed to escape through the main valve.

BAKER (GLADYS E.). **Nuclear behavior in relation to culture methods for Penicillium notatum Westling.** *Science*, N.S., xcix, 2578, p. 436, 1944.

This is a preliminary note on the results of a cytological study of *Penicillium notatum*, a full account of which is expected to appear shortly in *Bull. Torrey bot. Cl.* The conidia of the fungus were found to be predominantly uninucleate and only occasionally binucleate. It is argued that if a spore is heterotypic, then the genetic means of variation are present from the start, and if it is homotypic, the line can be developed monotypically provided no mutations occur. In mass spore transfers a few hours after germination there is marked anastomosis among the developing germ-tubes, conidia, and mycelia, giving abundant opportunity for nuclear interchange with resulting heterocaryotic vigour. As the analysis of cultural isolates indicates that the variations are due to a mixture of genetic factors following anastomosis and consequent heterocaryosis, it is considered that at present mass spore transfer methods offer as good a way as any of keeping cultures active.

Roy (B. S.) & Ray (J. N.). **Recovery of agar from used media.** *Curr. Sci.*, xiii, 4, pp. 98–99, 1944.

Details are given of a procedure for the recovery of used agar media from vaccine bottles. After autoclaving, the agar was filtered hot through muslin, allowed to gel, left covered with water overnight, broken into small pieces, and washed repeatedly until giving no turbidity with ferric chloride, indicating freedom from growth inhibitory substances. The washed agar was either used immediately or dried. The recovery was about 50 per cent.

Food yeast. A venture in practical nutrition.—29 pp., 4 diags., London, Colonial Food Yeast Ltd., 1944. 2*s.* 6*d.*

This booklet, prefaced by the Secretary of State for the Colonies, explains the origin and the function of Colonial Food Yeast Ltd., a Government undertaking sponsored by the Colonial Office and financed under the Colonial Development and Welfare Act, 1940. The Company has a factory in Jamaica, where the food yeast (dried *Torulopsis utilis*) [cf. *R.A.M.*, xxiii, p. 72] is produced. The product contains highly nutritive proteins and vitamins of the B complex and is expected to provide a cheap foodstuff much needed by Colonial people. The production is based on improved methods evolved at the Chemical Research Laboratory of the Department of Scientific and Industrial Research at Teddington under the direction of A. C. Thaysen, who describes them in Part III of this booklet. Other chapters are devoted to the nutritional and the commercial aspects of the problem. Appended are a table of comparative nutritional values of food yeasts and other foodstuffs; a table of the growth rates and nutritional requirements of *T. utilis*; diagrams of laboratory type glass growth unit, of the semi-technical scale plant, of the yeast seed vessel, and a flow diagram of the yeast factory.

Sperber (E.). **Torulopsis utilis and the citric acid cycle.** —*Nature, Lond.*, cliv, 3899, pp. 116–117, 1944.

This is an account of a cultural study on *Torulopsis utilis* [see preceding abstract], conducted at the Wenner-Gren Institute for Experimental Biology, University of Stockholm. It was found that *T. utilis* grown on ethyl alcohol could not utilize succinic acid but that it could be adapted rather easily to that substance in the presence of ammonia and its salts, and with much difficulty to malic, fumaric, or citric acid. After twice culturing on succinic acid, the yeast was able to attack all the four acids mentioned.

Proskauer (R.). **Fungus-proofing procedure.** —*Electronics, 1944*, pp. 92, 93, 224, 229, 232, 4 figs., 1944.

Electronic equipment frequently fails in the tropics, where the high relative humidity permits the ingress of moulds constituting a serious source of leakage. Of the 29 fungicides tested for the control of these organisms, as well as for heat stability, wet and dry dielectric strength, and corrosive effect in aqueous and lacquer media on panels of copper, low-carbon steel, cadmium-plated and silver-plated steel, and two aluminium alloys, and on rubber, neoprene, and other materials used in completed communications apparatus, an organic mercury salt appeared to be the most promising. Among the components for which protection is required are paper and metal-case capacitors, transformers, cotton-braided wire, and moulded- and laminated-phenolic parts.

Samsonova (Mme O. A.). **Free copper compounds in fabrics that have been impregnated to prevent decay.**—*Tekst. Prom., 1943*, 1-2, pp. 15–18, 1943. [Russian. Abs. in *Chem. Abstr.*, xxxviii, 5, pp. 1120-1121, 1944.]

Fabrics impregnated against decay may contain copper and chromium tannates,

aluminium soaps, aluminium and iron tannates, and copper soap [*R.A.M.*, xxiii, p. 266]. Moreover, since the protective treatment is followed by a neutralizing bath in a sodium carbonate solution, opportunity is afforded for the formation of aluminium hydroxide and malachite. The formation of copper compounds was investigated, the following mixtures being prepared: (1) tannins, copper sulphate, and dichromate, (2) copper soap, (3) solutions of soap, tannins, copper sulphate, and dichromate, (4) malachite, and (5) solutions of copper sulphate, dichromate, and sodium carbonate. The reaction between the tannins and copper sulphate proceeds slowly and does not reach completion, whereas dichromate reacts fully. The reaction between copper sulphate and sodium carbonate proceeds rapidly and practically completely. When two baths are used, copper may form tannates, soap, and basic carbonate, of which the first two are not stable to water extraction, while the third is. Copper compounds are extracted with boiling water because of the instability of copper tannates and soap and of combinations of copper and linen fibre. Therefore, the greater the copper content in the fabrics, the more 'free copper compounds' may appear. This is of interest in connexion with estimations of the strength and durability of the material, to which the presence of a large quantity of fixed copper contributes.

Stevens (W. H.). **Applications of chlorinated phenols.** *Chem. & Indust.*, *1944*, 19, p. 176, 1944.

Chlorphenols have wide and varied applications in the field of industrial preservation, being suitable, for instance, for the treatment of wood, leather [see next abstracts], cellulosic products, textiles [*R.A.M.*, xxiii, p. 71], proteins, starches and adhesive materials in general, rubber latex, and oils and paints [ibid., xxiii, p. 183]. For these and kindred purposes pentachlorophenol or its sodium salt are usually employed on account of their high degree of efficiency, accompanied by economy in use. Para-chlor-meta-cresol is also largely used for the preservation of proteins, gums, adhesives, and the like, while treatment with the tar acids themselves is likewise practicable where low cost is a determining factor.

The medicinal applications of the chlorphenols and the legal restrictions on their use are briefly discussed.

Lollar (R. M.). **Report on a study and the development of a mould-resistant treatment for leather. Report on mould-resistant treatments for leather.** — *J. Amer. Leath. Chem. Ass.*, xxxix, 1, pp. 12–24; 5, pp. 179–190, 1944.

A comprehensive, tabulated account is given of studies at the University of Cincinnati on the relative efficacy of a number of leather mould- and mildew-preventive agents, using as test organisms *Chaetomium globosum* and common species of *Penicillium* and *Aspergillus* [*R.A.M.*, xx, p. 304], and having special regard to the potential application of the chemicals by the Army in the tropics. The tests were carried out at a temperature of about 95° F. and 85 to 90 per cent. relative humidity, and the fungicides were incorporated into the vegetable-tanned samples from a solution or emulsion. Ethyl alcohol, Stoddard's solvent, carbon tetrachloride, and water were the solvents commonly used, while sulphated castor oil proved effective as an emulsifying agent. About half the weight of the solution was taken up by the leather during the three hours' drumming in distilled water to remove soluble substances which followed air-drying, and it was necessary to allow for this in calculating the amount of the active ingredient actually present.

The experimental results demonstrated the general efficiency for the object in view of salicylanilide, pentachlorophenol [see preceding abstract], penta-chloro-meta-xylenol, 2-mercaptobenzothiazole, 2,2′dichloro-5,5′ dihydroxy-diphenylmethane [cf. ibid., xxiii, p. 71], 2, 4, 5-trichlorophenol, tetrachlorophenol, and paranitrophenol. The minimum concentration of these compounds requisite to

confer protection is 0·25 per cent., so that a strength of 0·5 per cent. would in all probability be essential under the very exacting conditions likely to be encountered in tropical service.

Lollar (R. M.). **Report on toxicity studies on preservative bearing leather.** *J. Amer. Leath. Chem. Ass.*, xxxix, 6, pp. 203–209, 1944.

The results of studies carried out on dogs and horses exposed to contact with preservative-bearing leather [see preceding and next abstracts] indicated that no adverse effects on the animals' health need be expected to follow the use of 0·25 to 5 per cent. pentachlorophenol, paranitrophenol, salicylanilide, chloro-symmetrical xylenol, 2, 4, 5-trichlorophenol, tetrachlorophenol, 2-mercaptobenzothiazole, 5, 5′ dihydroxydiphenylmethane, and mixtures thereof.

Greene (H. S.) & Lollar (R. M.). **Report on preservatives in Army dubbings.**—*J. Amer. Leath. Chem. Ass.*, xxxiv, 6, pp. 209–220, 1944.

Paranitrophenol, para-chloro-meta-xylenol, pentachlorophenol, and tetrachlorophenol were shown to be very effective against moulds and mildew (*Aspergillus* and *Penicillium* spp. and *Chaetomium globosum*) when incorporated into dubbing, especially for the protection of Army shoe upper leather [see preceding abstracts]. The mixture recommended consists of 0·8 per cent. each of paranitrophenol, para-chloro-meta-xylenol, and tetrachlorophenol; pentachlorophenol may be substituted for para-chloro-meta-xylenol if the latter is unobtainable. This formula preserved grain-finished samples for periods upwards of nine weeks and flesh-finished leather for five.

Schaede (R.). **Die Symbiose in den Wurzelknöllchen der Podocarpeen.** [Symbiosis in the root nodules of the Podocarpeae.] *Planta*, xxxiii, 5, pp. 703–720, 9 figs., 1943.

Full particulars are given of the writer's studies at the University of Breslau on the nature of the symbiotic process in the root nodules of *Podocarpus chinensis* and *P. nubigena* [cf. *R.A.M.*, iii, p. 225]. The host cells were found to be occupied by a non-septate fungus, provisionally named mycelium *P.*, forming in the cortex a loose coil of hyphae, 2 to 6 μ in diameter, with arbuscules, barely 1 μ in diameter, and so densely bunched as to resemble a 'witches' broom' or cauliflower head, and spherical or piriform, mostly terminal, occasionally lateral vesicles [cf. ibid., xviii, p. 468]. Eventually, the entire mycelium with the exception of the membranes and some of the vesicles, is ingested by the host. The detection of vesicles with their contents divided into a periplasm and a multinuclear ooplasm, evidently representing oogonia and sporangia, indicates that the fungus is a Phycomycete belonging to the Peronosporaceae and possibly a member of the Albugineae. The vesicles did not proceed to a reproductive phase; on the contrary, their contents gradually became homogenized and partially disappeared.

The root nodules do not arise in consequence of fungal infection, which only takes place at an advanced stage or the conclusion of their development, while some were free of any extraneous organism. The regular disintegration of the cortex in these bodies corresponds to the normal behaviour of the root cortex in certain Gymnosperms and has no connexion with symbiosis. Since the endophytic mycelium is only in very slight contact with the soil, there is no question of its acting as a channel of nutrient supply to the host. It is rather to be regarded as an innocuous parasite, the ingestion of which by the plants is a form of defence mechanism.

Invasion by the endophyte does not affect the size of the root nodule cells and only slightly increases their cytoplasm content. The nuclei are somewhat enlarged and their structure insignificantly coarsened. The plurinuclear condition, common

to infected and fungus-free cells, is a sequel to mitoses without subsequent cell division; these occur exclusively in uninvaded cells, which must therefore be occupied by several nuclei before the advent of the endophyte.

NEILL (J. C.). **Rhizophagus in Citrus.**—*N.Z. J. Sci. Tech.*, A, xxv, 5, pp. 191–201, 7 figs., 1944.

Rhizophagus [*R.A.M.*, xviii, p. 470] was detected in the tertiary roots of 128 citrus trees, representing all the varieties grown in New Zealand, and in roots of the same host from three localities in Australia, Rarotonga (Cook Islands), and Riverside, California (sweet orange grafted on various rootstocks). Hyphae of the same organism, generally furnished with arbuscules and vesicles, were further detected in the roots of all local pip and stone fruits, nuts, berries, hedge and herbaceous plants, cereals, grasses, and weeds, as well as in those of native pines, broadleaf trees, shrubs, lilies, and ferns collected from primeval forests and heaths remote from human contact; it has not, however, been identified with certainty in the roots of exotic pines harbouring Basidiomycetous mycorrhizal fungi.

The hyphae of the endophyte are very variable in size, the main trunk branches attaining a maximum diameter of 15 μ and subsidiary ones a minimum of 2 μ. When forming part of a living mycelium the hyphae have thin, hyaline walls, the lumen filled with multinucleate protoplasm in constant 'streaming' motion. From such hyphae septa are absent, but on an encounter with unfavourable conditions, the protoplasmic contents appear to retract, leaving a residue of septum-like partitions cutting off the empty tube or even an entire mycelial complex. Such conditions commonly arise when an extraneous hypha penetrates a root, the portion external to which is cut off by one to several pseudo-septa at or near the point of ingress, and emptied of its protoplasmic contents, the walls becoming yellow and opaque. The most characteristic feature of the mycelium is the constant anastomosis of the hyphae, which sometimes results in the formation of a closed system of inter-communicating passages traversed by moving protoplasm.

Infection hyphae penetrate directly through an epidermal cell, an irregular, knot-like swelling being formed at the site of entry and often a contorted mass within the cell itself. As a rule, the hyphae then begin to ramify through the intercellular spaces, but sometimes direct cell penetration extends almost to the endoderm, which is, however, not actually invaded. The vesicular-arbuscular system of the endophyte has been adequately described by Butler [loc. cit.] and others.

The age and physiological state of the particular root among over 2,000 specimens examined appeared to be the governing factors in the relative abundance of *R.*, botanical differences in the host being apparently of little or no importance, at any rate in the five species of citrus investigated. Hyphae with vesicles predominate in semi-moribund rootlets. The cortex of feeding roots is occupied only at an early stage of growth by hyphae with arbuscules and vesicles, which disappear during the ensuing period of vigorous development. As the growth rate decreases, however, the intracortical hyphae increase and anastomose into a network of vesicles and arbuscules penetrating most of the adjacent cortical cells. Extracortical hyphae likewise proliferate, form fresh points of ingress, send out branches into the soil, and sometimes form anastomosing networks bearing vesicles, which in perennial plants gradually disappear. This process is not complete when growth recommences, at any rate in citrus, but reinfection seems to take place by the penetration of extraneous hyphae rather than from an elongation of the residual intracortical mycelium. At this juncture occasional stout hyphae of regular contour can be traced on a perpendicular course from the root epidermis into the soil; they probably arise from the deep-seated complex in the mature roots and penetrate the epidermis of the new ones as infection hyphae.

Notwithstanding repeated attempts, pure cultures of the citrus endophyte have

not yet been obtained. In the present studies, tertiary rootlets from seedlings grown in old beach sand were thoroughly washed, dried, and deeply planted in Petri dishes of soil-water agar. Very few of the hundreds of root sectors grown in this way remained free from a bacterial halo, and those that did so failed to develop further. At 21° C. the *R.* hyphae can normally be detected after 48 hours, and by the tenth day a length of 5 to 6 cm. is attained, after which growth ceases. Anastomosis between the lateral branches may occur, but no close mycelial mat is formed. No external development of the endophyte takes place from roots submerged in water, which are thick, unbranched, and completely unlike the normal ones produced in soil. Experimental evidence indicates that *R.* is neither harmful nor beneficial to its citrus hosts, no consistent differences having been observed at the end of six months between inoculated and non-inoculated grapefruit and *Citrus* [*Poncirus*] *trifoliata* plants, or after three months between the same two categories of sweet orange seedlings.

Like the grass endophytes [ibid., xxiii, p. 229], *R.* appears to have achieved a state of physiological balance with its hosts, neither enhancing nor reducing their general well-being, at any rate in the case of young plants. It is thus, in all probability, of little economic significance, but its taxonomic position raises problems of considerable interest, more especially in connexion with the apparent absence of a reproductive system, as ordinarily understood, and its origin in a period of remote antiquity.

Meyer (J. R.). **Experiências relativas à ação da tiamina (vitamina B) sobre a germinação e desenvolvimento de sementes de Orquídeas em meios assimbióticos. Meio assimbiótico simplificado para culturas de sementes de Orquídeas.** [Experiments on the action of thiamin (vitamin B) on the germination and development of Orchid seeds in asymbiotic media. A simplified asymbiotic medium for Orchid seed cultures.]—*Biológico*, ix, 12, pp. 401-406, 2 pl., 1943; x, 3, pp. 63–66, 1944.

In these experiments seeds of *Rodriguesia* sp., *Cattleya harrisoniae* [*C. loddigesii*], and other orchids were sown on Knudson's or a modified Sladen's medium in the absence of the symbionts [*R.A.M.*, xxii, p. 171] with and without thiamin (vitamin B_1). The thiamin series showed more rapid development of the foliage and root system than the controls, which remained stunted.

A number of species of orchids were grown on a medium consisting of 250 c.c. each of tomato juice and distilled water with 9 gm. chopped agar. Development of these seedlings was superior to that of the controls on standard media. In view of the results obtained in the thiamin experiments, the B_1 content of tomato may be significant.

Bawden (F. C.) & Sheffield (F[rances] M. L.). **The relationship of some viruses causing necrotic diseases of the Potato.** —*Ann. appl. Biol.*, xxxi, 1, pp. 33–40, 1 pl., 1944.

An examination of potato material containing potato virus B free from contamination with potato virus X showed that B is a strain of X [*R.A.M.*, xxii, p. 368]. No significant differences were found to exist between the properties of the two in sap from infected tobacco. Inoculation of tobacco leaves with virus B gave protection against virus X. Three other viruses, designated X^a, X^s, and X^y, were also demonstrated to be strains of virus X; differences between them could be shown by cross-absorption tests, but not by serological analysis. All these strains produced intracellular inclusions, varying with different hosts and virus strains, but generally, except for strain B, larger and more frequent in potato than in tobacco or tomato plants. All gave systemic infection when inoculated into tobacco, tomato, and potato varieties in which they are carried or cause mosaic symptoms; and some

when inoculated to varieties in which they produce top necrosis, while others caused only local lesions.

Potato virus C was shown to be a strain of Y. Similar symptoms were produced by both in tobacco and a few potato varieties, but in those varieties in which Y caused leaf-drop streak, C caused top necrosis. C produced systemic infection in tobacco and also in potato varieties in which it causes mosaic symptoms but not in those in which it causes top necrosis. Attempts to transmit virus C by *Myzus persicae* were unsuccessful.

Virus A is considered to be unrelated to either Y or X. A few small intracellular inclusions were found in tobacco and potato plants infected with either C or Y, but none in those infected with A.

In conclusion it is pointed out that symptomatology is not a reliable basis for classifying viruses, as related strains may produce widely different diseases in the same host, while unrelated viruses may cause identical symptoms.

Sessous (G.) & Pielen (L.). **Versuche zur Einschränkung des durch Viruskrankheiten hervorgerufenen Abbaues der Kartoffel durch anbautechnische Massnahmen.** [Experiments in the reduction of Potato degeneration due to virus diseases by cultural methods.] —*J. Landw.*, lxxxix, 1, pp. 32–48, 5 figs., 1942. [Abs. in *Exp. Sta. Rec.*, xci, 1, p. 43, 1944.]

The writers' experiments were designed to determine the feasibility of directing cultural methods towards the reduction of potato 'degeneration' of virus origin in Germany, among the factors investigated being distance from infection foci and changes in planting and harvesting dates and in the direction of the rows [cf. *R.A.M.*, xxiii, p. 146]. The results of the studies indicated that, with increasing distance from the focus of infection, severe cases decreased fairly uniformly up to the tenth row. Early harvesting showed no more favourable results than late harvesting. The growth of a second crop favoured infection. The direction of planting caused considerable differences in the proportion of severe cases and in yield, ascribable only in part to wind velocity and direction.

Hansing (E. D.). **A study of the control of the yellow-dwarf disease of Potatoes.**— *Bull. Cornell agric. Exp. Sta.* 792, 28 pp., 3 graphs, 1943.

An abstract of the work described in detail in the present bulletin has already been noticed [*R.A.M.*, xxi, p. 264]. The following additional items of information are of interest. A survey of commercial potato fields in Steuben county, New York State, showed that the varieties Rural, Katahdin, and Chippewa averaged, respectively, 15·8, 0·14, and under 0·1 per cent. plants affected with yellow dwarf. The difference between the figures for Rural and either of the other varieties was highly significant. A medium to high percentage of infected plants occurred in all samples of Green Mountain potatoes for each planting date satisfactory for commercial production in western New York. There was little spread of yellow dwarf to Chippewa or Katahdin for any date of planting. The difference in the spread to Green Mountain and either of the other two varieties was highly significant. A medium to high current-season spread occurred in potatoes isolated in medium red, mammoth red, and alsike clover fields. A medium to high percentage of infected plants occurred in samples from potato plots isolated in lucerne, clover, meadow, oat, and maize fields. A potato plot isolated in a dense wood did not become infected. The average current-season spread to Green Mountain and Katahdin, isolated in clover, meadow, and lucerne fields, was 29·9 and 0·82 per cent., respectively, a highly significant difference.

In a greenhouse test, potato plants did not carry the virus through the second season without showing symptoms. Diagnosis by slicing half tubers, observing the number that presented spots, and multiplying by a factor (derived from indexing

comparisons) was found approximately to indicate the number of infected tubers. Diagnosis by inoculating leaves of *Nicotiana rustica* with the sap and ground tissues of tubers gave less accurate results.

Schlumberger (O.). **Die Zuverlässigkeit der Kartoffelkrebs-Prüfungen.** [The reliability of the Potato wart trials.] *Forschungsdienst*, xvi, 5, pp. 215–220, 1943.

The discovery of new biotypes of the potato wart fungus (*Synchytrium endobioticum*), capable of causing severe local damage to certain approved varieties in Germany [*R.A.M.*, xxii, p. 273], has cast some doubt on the reliability of the official trials for immunity from disease. The phytopathological experts engaged in this work are, however, fully alive to this aspect of the problem, and the 'Giessübel' (Thuringia) physiologic race was included among the collections serving as inoculum for the 169 varieties comprised in the 'main' series of trials in 1942–3, i.e., those carried out at three stations on 50 tubers of each survivor of the preliminary tests with (*a*) one tuber and (*b*) 20 tubers each of varieties affording good prospective material for breeding. In view of these stringent precautions for the exclusion of susceptible strains among the authorized immune varieties, the likelihood of even a local outbreak of major dimensions appears remote.

Tervet (I. W.). **Alternaria tuber rot and other diseases on stored Potatoes in North Dakota.** *Plant Dis. Reptr*, xxviii, 3, pp. 94–96, 1944. [Mimeographed.]

A survey of potatoes in storage in North Dakota showed dry rot (*Fusarium* sp.) to be the most widely spread and harmful disease.

Attack by *Alternaria solani* was unusually heavy in three localities, where infection was so severe that a few lots of Cobblers, Chippewas, and Red Warbas fell below certified seed grade standards, and the growers concerned suffered considerable losses. Triumphs were attacked only occasionally and never to such an extent as to affect the grading of the crop; no lesions were found on the Katahdins. Lesions on Cobblers were as large as 2 in. in diameter; many tubers had several small ones, ¼ to ½ in. in diameter; not infrequently elongated, narrow lesions were seen, which seemed sometimes to follow cracks or cuts in the skin. Not all potatoes in the three districts were attacked, as fields of Cobblers situated near heavily infected ones of the same variety showed only slight infection. Vine infection was not more severe where tuber infection was heavy than where it was slight. The reasons for the serious occurrence of the disease in the three localities mentioned are as yet not fully understood.

Granovsky (A. A.). **The value of DDT for the control of Potato insects.** *Amer. Potato J.*, xxi, 4, pp. 89–91, 1944.

Preliminary field tests in Minnesota in 1943 indicated that the insecticide DDT possesses considerable fungicidal value, potato plots dusted with this material at a 5 per cent. level in Pyrax ABB showing less early and late blight [*Alternaria solani* and *Phytophthora infestans*, respectively] than plots treated with various fungicides commonly used in potato fields.

Störmer. **Massnahmen zur Gesundheitspflege bei Pflanzkartoffeln.** [Hygienic precautions for seed Potatoes.]—*Mitt. Landw., Berl.*, lviii, 25, pp. 475–478, 2 figs., 1943.

Irregularity in the emergence of potato seedlings, which is the rule rather than the exception in Germany, especially in the north-east, is attributable chiefly to infection by *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xxiii, p. 355]. This pathogen, which is responsible for much heavier damage than usually recognized, may be

effectively combated by the postponement of planting until the soil temperature reaches a maximum of 8° C., shallow planting, and the application to the soil of an active nitrogenous manure, preferably in the form of ammonium sulphate (2 doppelzentner [200 kg.] per ha.), placed directly in the plant holes immediately before or at planting. These practices are designed to expedite the formation of aerial leaf rosettes, at which stage sufficient resistance has been acquired to repel the parasite.

Some varieties, notably among the older types, are 100 per cent. infected by comparatively mild forms of mosaic, e.g., Erstling [Duke of York] with the X virus, Juli and Allerfrüheste Gelbe with A. These two viruses, as well as leaf roll and streak [potato virus Y], are harboured in a latent form by some of the varieties officially designated immune, and may cause severe injury under adverse weather conditions for the host. The inspection of stands with a view to the elimination of diseased plants should be made at an early date, before the combined effects of warmth and luxuriant growth have 'masked' the symptoms. Although the relatively weak viruses A and X do not cause the heavy losses associated with leaf roll and Y, they may reduce the yield by as much as 20 per cent., and are therefore not to be disregarded. The more serious leaf roll and Y are heavily penalized in stands submitted for seed certification, the standards for which are so high that they can only be reached by the utmost stringency in respect of virus exclusion. The detection of X presents considerable difficulty, and should never be attempted in bright sunlight; early morning and late afternoon are the more suitable times for a search for this virus, or a dull day may be chosen for the purpose. The peach aphid [*Myzus persicae*], largely responsible for potato virus transmission, prefers sheltered to exposed sites, hence it is advisable to choose the latter for potato fields. Excessive manuring should be avoided, since undue luxuriance of growth tends both to conceal the symptoms of infection and to attract the aphid vectors. Since there is a grave risk of virus spread from diseased to healthy neighbouring stands, a minimum distance of 20 m. is allowed by the latest regulations between a crop intended for certified seed and one with over 10 per cent. severe virus infection.

Another prevalent disease, especially on sandy soils, is black leg (*Bacterium phytophthorum*) [*Erwinia phytophthora*], which does not usually involve all the shoots on a given plant and may therefore be partially controlled by the timely removal of the infected ones before tuber formation. Another means of combating the pathogen consists in the excision of the hilum, through which infection enters the tuber. In general, the cutting of seed potatoes is not to be recommended, but where the practice is necessary, the knife should be plunged in a 10 per cent. formalin solution after each cut to prevent the transmission of *E. phytophthora*. Suberization of the cut surface occurs only in the presence of at least 80 per cent. atmospheric humidity, and the sterilized slices should therefore be planted immediately, or if this is impracticable, temporarily covered with damp sacking.

Two applications of 1·5 to 2 per cent. Bordeaux mixture should be made against late blight (*Phytophthora*) [*infestans*], the first just before flowering and the second a fortnight to three weeks later. The best results have been obtained by the 'Palatia' portable spraying machine (Platz, Ludwigshafen), with a capacity of 600 l. per hr., while Dr. Sack's apparatus is also effective and consumes only 200 to 250 l., but in this case a higher concentration of the fungicide (4 to 5 per cent.) is requisite.

Burgess (A. H.), Beard (F. H.), Keyworth (W. G.), & Massee (A. M.). **The problems and practice of Hop growing. The culture, drying, diseases and pests of the Hop.**—*J. Inst. Brew.*, N.S., xl, 3, pp. 118-139, 3 figs., 1943.

The information presented by W. G. Keyworth on the fungal and virus diseases of hops in England (pp. 128–135) has already been noticed in this *Review* from other sources.

Stevenson (E. C.). **Diseases of drug and related plants at the Plant Industry Station, Beltsville, Maryland, in 1943.**—*Plant Dis. Reptr*, xxvii, 25, pp. 700–703, 1943. [Mimeographed.]

In these notes on diseases of drug and related plants observed at Beltsville, Maryland, in 1943, it is stated that during the spring *Ricinus communis* seedlings became extensively affected by a disease involving the cotyledons or growing point, or both, and usually attacking the stem just below ground-level. Infection of the growing point in most cases proved fatal. A species of *Alternaria* was consistently isolated from the diseased tissue. In June, coriander showed localized infections at soil-level or at various heights along the stem. A lesion near the apex of the stem caused the tissue to collapse, with resulting production of a 'gooseneck' effect, the tissue above the lesion often remaining green and active. The leaves of some affected plants wilted and turned brown. A species of *Fusarium* was consistently isolated from tissue transplants, and *F.* spores developed on lesions in a damp chamber. Tobacco mosaic destroyed almost all the first-year planting of *Hyoscyamus niger* in 1942, but in 1943 the disease was less destructive on similar material. *Perilla frutescens* was affected by wilt. The stem showed a cortical rot at and immediately above soil level. The plants wilted, bent over at the top, and died. Apparently, the condition attacked small plants or caused stunting. A species of *F.* was repeatedly isolated from affected material. Towards the end of June, sage plants scattered about the field developed wilting of the outside branches. The cortex at and just above soil-level darkened and disintegrated. When the centre wilted, death ensued, but in other cases recovery seemed to occur. A species of *F.* was isolated from diseased material.

L. (H. M.). **The Sugar industry of Cuba.** *Int. Sug. J.*, xlvi, 546, pp. 146–148, 1944.

The planting of the mosaic-susceptible sugar-cane variety Co. 213, imported into Cuba from Puerto Rico and introduced into the Santa Clara province in 1931 in an effort to replace the decadent Cristalina [*R.A.M.*, xxi, p. 98], was stated by J. G. Salinas at the 16th meeting of the Sugar-Cane Technologists of Cuba to have resulted in heavy financial losses. Co. 213 failed particularly in 1942, partly owing to the excessive rainfall during ripening, but the variety also suffers severe damage from the borer, *Diatrea saccharalis*. A change of variety is urgently called for, and the following are recommended: P.O.J. 2878 [loc. cit.], which is almost immune from mosaic, and Media Luna 3 18 (derived from P.O.J. 2878 and S.C. 12(4)), a heavy cropper and apparently immune from mosaic.

L. (H. M.). **Sugar cane investigations in Jamaica.**—*Int. Sug. J.*, xlvi, 548, pp. 202–204, 1944.

In this review of the Annual Report of the Research Department, Sugar Manufacturers' Association, 1942–43, the author includes some notes on the reactions to mosaic of some of the more important sugar-cane varieties which are being tested on Jamaican estates in a search for a range suitable to the divergent environmental conditions prevailing on the Island [*R.A.M.*, xx, p. 226]. B.3439 is highly resistant to mosaic and its juice is exceptionally sweet, but a defective root system impairs its ratooning capacity under unfavourable soil conditions. The chief drawback of the high-yielding B.34104 is susceptibility to a mild form of mosaic, which does not persist in older canes but may constitute a source of infection for other productive varieties grown in its vicinity. The susceptibility to mosaic of the popular B.H.10(12), which does not excel either in tonnage or juice quality, is likely to result in its replacement in the near future by other varieties.

Chona (B. L.). **Sugar-cane smut and its control.** *Indian Fmg.*, iv, 8, pp. 401–404, 2 pl., 1943.

In India, there are two main flushes when sugar-cane affected by smut (*Ustilago*

scitaminea) [*R.A.M.*, xxii, pp. 197, 225] produces smut whips in profusion, the first in May and June, and the second in October and November. Under Delhi and Karnal conditions, the hot weather flush seems to be the major one, while in Bihar most infections occur in October and November, as the crop is ripening. It appears that all cases of primary infection, i.e., when setts which are planted harbour internal infection or contract infection soon after planting, develop the smut whips in May or June, while most infections occurring late in the season result from secondary infection.

In Co. K. 26, Co. 508, and Saretha, smut infections were observed on young leaves, forming small, slightly raised galls with a corrugated surface, covered with a silvery-white membrane which soon flaked off, exposing masses of dark, powdery spores. Infection tests with spores from leaf galls gave rise to typical infection.

The spores germinate readily under moist conditions, forming a promycelium, which divides transversely into three or four cells, each bearing a sporidium. Under favourable nutrient conditions, the sporidia may bud off more sporidia in short chains. Sometimes, the promycelium grows out into a branched hypha which acts as the infection thread. The mycelium grows between the host cells and sends haustoria into them but quickly becomes so depressed that it cannot easily be traced in the host tissue, except in the whip.

When infection occurs early, the smutted clumps produce only thin, spindly canes or small, grassy shoots, but if it takes place later on, a few millable shoots may be produced. The disease appears to be increasing. Co. 213 and Co. 299 showed considerable infection in a few fields, Co. S. 5, Co. 538, Co. K. 25, Co. K. 26, Co. K. 28, and Co. K. 30 were appreciably infected at the Gorakhpur Farm, Co. 312 showed 12 to 50 per cent. infection at Fyzabad, and Co. 313 about 5 per cent. smut in three localities but in several others was severely affected. The thin indigenous reed canes are highly susceptible, while the thick Ponda (*Saccharum officinarum*) varieties have a low smut incidence. In resistance tests Co. 513, Co. 531, Co. K. 10, Co. K. 25, Co. 362, Co. 526, Co. 433, Co. 444, Co. 417, Co. 532, Co. K. 26, and 524 developed 20 to 40 per cent. smut, whereas Co. 313 showed only 10 to 15 per cent. infection.

Effective control results from systematic roguing and careful selection of seed material for three successive seasons. In a 12-acre block of cane where certain Co. 313 plots showed up to 50 per cent. smut, incidence fell to about 3 to 4 per cent. after the first season of roguing and seed selection. Roguing was continued at short intervals throughout the second season, and incidence was reduced to about one-fortieth of the original infection. In the third and present season, roguing is being continued, and incidence is negligible. In roguing, the smut whip should be cut off and placed in a closely woven bag, so that the spores are not dispersed. Entire clumps, if found to be affected, should be removed, not merely individual smutted canes. When setts from smutted canes of 16 varieties were dipped for 10 minutes in water at 55° to 60° C. and then planted, all the plants remained unaffected, though the untreated controls developed 87 per cent. infection. Further investigations into the hot-water treatment are in progress.

Cross (W. E.). **Variedades de Caña resistentes al 'carbón'.** [Cane varieties resistant to 'smut'.]—*Bol. Estac. exp. agríc. Tucumán* 45, 25 pp., 1944.

During the season of 1943-4, the C.P. 29/320, Kavangire, P.O.J. 213, and Tuc. 407, 472, 1376, and 1400 sugar-cane varieties sustained fairly severe damage from smut [*Ustilago scitaminea*: *R.A.M.*, xxiii, p. 189] and should be excluded from future plantings in Tucumán, Argentina, although reasonably high yields are admittedly obtainable, at any rate for a number of years, from the immensely vigorous and productive P.O.J. 213 and Tuc. 472 and 1376. The following, on the other hand, remained virtually immune from the disease: Co. 290, P.O.J. 2725,

2727, and '2961' (botanically identical with 2878), and Tuc. 379, 1111, 1149, 1190, 1296, 1406, 1422, 1590, 2605, 2611, 2613, 2622, 2634, 2645, 2651, 2657, 2680, 2683, 2701, 2704, and 2705. A fair degree of resistance was shown by Co. 270, 281, 284, and 289, C.P. 807, P.O.J. 1337, 1507, 2878, and Tuc. 630, 1139, 1199, 1220, 1231, 1238, and 1316. Descriptions are given of the distinguishing features of the immune and resistant varieties, of which Co. 290, 270, 281, and 284, P.O.J. 2725 and 2878, and Tuc. 379, 1111, 1406, 2622, 2645, 2680, 2683, 1199, and 1316 are already being grown on a commercial scale.

HANSFORD (C. G.). **Contributions towards the fungus flora of Uganda. V. Fungi Imperfecti.**—*Proc. Linn. Soc. Lond., 1942 3*, 1, pp. 34–67, 15 figs., 1943.

This further instalment of the author's annotated list of Uganda fungi [*R.A.M.*, xx, p. 597] includes the following items. The 39 hosts of *Macrophomina phaseoli*, ordinarily a weak parasite in the colony, are listed. *Coniothyrium fuckelii* causes rose canker. *Septoria dianthi* is present wherever carnations are grown, and *S. lycopersici* is widespread on tomatoes. *Diplodia natalensis* has been found on orange twigs.

Colletotrichum [*Glomerella*] *gossypii* occurs on cotton bolls, mostly in wet seasons. *C. lindemuthianum* is present on old bean leaves and pods. *Cylindrosporium tephrosiae* n.sp. forms lenticular, often confluent, white to pale buff, dark-bordered interveinal spots, 3 by 1 mm., on the upper side of *Tephrosia vogelii* leaves, those on the under surface being light brown with less prominent margins. The hyaline acervuli, emerging through the stomata, measure 20 to 40 μ in diameter and up to 10 μ in height, and the parallel, erect, filiform, tri- to quinqueseptate conidia, slightly tapering towards the apex, 55 to 110 by 3 μ. Severe infection results in defoliation.

Hyalodendron album [ibid., xv, p. 70] on *Vigna* and *Phaseolus* exactly resembles *Cladosporium herbarum* except for the persistent absence of colour in all parts. Tomatoes are subject to infection by *C. fulvum* under humid conditions. *Piricularia oryzae*, the agent of rice 'blast', is a limiting factor in the production of the crop and also causes serious damage to *Eleusine coracana*; on *Digitaria* it is usually restricted to the foliage.

Heterosporium echinulatum [*Didymellina dianthi*] has been observed on carnation leaves and *H. lagunense* on dead *Canavalia ensiformis* stems and pods. *Phormium tenax* leaves in the Entebbe Botanic Gardens bore the dark brown to black patches characteristic of *Dendryphiella interseminata*. *Curvularia lunata* is widely distributed on sugar-cane and other Gramineae. *Helminthosporium capense* is a parasite of *Meliola*, *Irene*, *Irenina*, and *Irenopsis* spp. It was first described by Thümen as a parasite of *Canonia* and *Osyris* leaves from South Africa (*Flora*, lix, p. 570, 1876), but an inspection of the original collections showed that in both cases the fungus was growing directly on Meliolineae on these hosts. A list of synonyms is given, including *Helminthosporium coffeae*. *H. helianthi* n.sp. forms blackish-brown, zonate spots, with ashy centres, up to 10 mm. in diameter, on leaves of sunflowers. The conidia are elongated, ellipsoid, straight, rounded at the base, with the hilum entirely within the curve of the basal cell, 2 to 8 septate, 30 to 90 by 11 to 16 μ. The conidiophores are unbranched, 2- to 5-septate, 70 to 120 by 8 to 10 μ. *H. musae-sapientum* n.sp. forms blackish-brown, oval spots, 10 to 15 mm. in length, on banana leaves. The erect conidiophores are 70 to 250 by 9 to 12 μ and the conidia straight or curved, ellipsoid or subcylindrical, 4- to 12-septate, 55 to 135 by 16 to 27 μ. *Sporodesmium bakeri* Syd. was detected on the dead leaves of a Liliaceous plant in the Entebbe Botanic Gardens. *Sorghum verticilliflorum* leaves were infected by *Clasterosporium maydicum*. *Stigmella sacchari* Speg. occurs on sugar-cane and germinating rice seeds, and has been cultured from a parasitized colony of *Meliola*. *Alternaria gossypina* and *A. macrospora* [*R.A.M.*, xx, pp. 461, 573]

have been observed on cotton leaves, and the latter was also isolated from stained lint; *A. longipes* produces large spots on tobacco foliage, and *A. sesamicola* infects the stems of sesame (*Sesamum indicum*) [ibid., xi, p. 350]. *Cercospora anethi* attacks *Anethum graveolens*, *C. atrocincta* is ubiquitous on *Zinnia elegans*, groundnuts are infected by *C. arachidicola* and *C. personata*, *Boehmeria nivea* by *C. boehmeriae*, *Cinchona* by *C. cinchonae*, coffee by *C. coffeicola*, potato by *C. concors* [ibid., xx, pp. 234, 447], cowpea by *C. cruenta*, *Crotalaria juncea* by *C. demetrioniana*, cotton by *C.* [*Mycosphaerella*] *gossypina*, sugar-cane by *C. longipes*, mango by *C. mangiferae*, banana by *C. musae* [*M. musicola*], buckwheat by *C. polygonacea*, *Ricinus communis* by *C. ricinella*, roses by *C. rosicola*, and sorghum by *C. sorghi*. *C. papayae* n.sp., the agent of blackish-brown, irregular, confluent spots, 5 to 10 mm. in diameter, on papaw leaves, is characterized by fasciculate, olivaceous to black, erect, bi- to quadriseptate, simple conidiophores, 80 to 130 by 4 to 5 μ, occurring in bundles of up to 30 and showing abrupt geniculations at the conidial attachments, the scars persisting as dark olive, raised, thickened areas of the wall, and hyaline, filiform, 8- to 17-septate conidia, tapering towards the apex and rounded at the base.

Dendrochium gigasporum Bres. & Sacc. was isolated from dying *Cajanus indicus* stems. *Camptomeris tephrosiae* n.sp., the agent of a lenticular, yellow to brown leaf spot of *T. candida*, resulting in defoliation, is characterized by straight, olive-brown, bi- to triseptate, simple conidiophores, 30 by 10 μ, tapering towards the base, and clavate to cylindrical, blackish-brown, tri- to quinqueseptate conidia, 50 to 95 by 16 to 22 μ, truncated at the base and rounded at the apex.

Wollenweber (H. W.). **Fusarium-Monographie. II. Fungi parasitici et saprophytici.** [*Fusarium* monograph. II. Parasitic and saprophytic fungi.]—*Zbl. Bakt.*, Abt. 2, cvi, 8–10, pp. 171–202, 27 figs., 1943.

This further contribution to the author's monograph of the genus *Fusarium*, prepared on similar lines to the foregoing [*R.A.M.*, x, p. 626], comprises 26 species, 14 varieties, and four forms in the six groups *Macroconia*, *Submicrocera*, *Pseudomicrocera*, *Sporotrichiella*, *Roseum*, and *Martiella*. The perfect stages of four of these groups are known, viz., *Nectria* of *Macroconia*, *Calonectria* of *Submicrocera* and *Pseudomicrocera*, and *Hypomyces* of *Martiella*, while a genetic connexion is surmised to exist between *Roseum* and *Gibberella*. Fourteen related and other Hypocreaceae are also included in the list.

F. avenaceum, with over 70 synonyms and nearly 200 hosts, is one of the most ubiquitous representatives of the genus, while another cosmopolitan is *F. solani*.

Of special interest are the members of the *Macroconia* and *Pseudomicrocera* groups parasitizing scale insects and other pests in citrus groves and the like. The type species of *Pseudomicrocera* is *F. coccidicola* P. Henn., the conidial state of *C. diploa* (Berk. & Curt.) Wollenw. [ibid., xviii, p. 504].

N. ecoccophila Wollenw. n.n. is the new name applied to *N. coccophila* (Tul.) Wollenw. & Reinking [ibid., xiv, p. 708] (syn. *Sphaerostilbe coccophila* Tul., *Corallomyces aurantiicola* (Berk. & Br.) Höhn.). It is proposed to exclude the following: *F. juruanum* P. Henn. (1904), *F. lateritium* Nees var. *minus* Wollenw., and *F. cerasi* Roll. & Ferry. as being identical, respectively, with *F. coccidicola* P. Henn. (1903), *F. lateritium* Nees, and *Micula mougeotii* Duby.

Slipp (A. W.) & Snell (W. H.). **Taxonomic-ecologic studies of the Boletaceae in northern Idaho and adjacent Washington.**—*Lloydia*, vii, 1, pp. 1–66, 8 pl., 1944.

This annotated and illustrated list of 23 species of Boletaceae from northern Idaho and adjacent Washington is introduced by a discussion of the zones in which they occur; of their relation to forest associations and to mycorrhiza, it becoming

increasingly apparent that these species are important and regular constituents of the latter; and of the effect of association and environment upon intraspecific variations. The list is provided with one key based on gross characters and another on generic distinctions, and a synopsis of the genera of the Boletaceae as proposed by Snell (*Mycologia*, xxxiii, pp. 415–423, 1941; xxxiv, pp. 403–411, 1942) is included.

Martin (G. W.). **The Tremellales of the north central United States and adjacent Canada.**—*Univ. Ia Stud. nat. Hist.*, xviii, 3, 88 pp., 5 pl., 1944.

This is a critically annotated list, supplemented by keys to the genera and species of the Tremellales of the north-central United States (comprising Ohio, western Kentucky, Michigan, Indiana, Wisconsin, Illinois, Minnesota, Iowa, Missouri, and the eastern portions of North and South Dakota, Nebraska, and Kansas) and the southern regions of the Canadian Provinces of Ontario and Manitoba. The taxonomy and morphology of the group are discussed in a prefatory note, and three new combinations are proposed.

Singer (R.). **A monographic study of the genera 'Crinipellis' and 'Chaetocalathus'.** - *Lilloa Rev. Bot. Tucumán*, viii, 2, pp. 441–534, 6 figs., 1942. [Spanish summary. Received June, 1944.]

The author's exhaustive, critical survey of the genus *Crinipellis*, described as one of the most important genera of Agarics for phytopathologists, and his new genus *Chaetocalathus* has involved a revision of their taxonomic relations and the establishment of a number of new species and combinations. Among the parasitic members of the former genus are *Crinipellis perniciosa* comb.n. (*Marasmius perniciosus* Stahel), the agent of witches' broom of cacao; *C. stipitaria*, widely distributed in Europe, North Africa, and the United States on living roots and green parts of Gramineae, including rye and other cereals; *C. pseudostipitaria* n.sp., and allied tropical forms collected, for instance, on *Panicum maximum* in Guadeloupe and *Andropogon* in the Niger valley, West Africa; and *C. siparunae*, which annually attacks living *Siparuna* trees from Brazil in a greenhouse of the Leningrad Botanical Garden, branches and twigs up to 10 ft. above soil-level being affected.

Stahel's diagnosis of *M. perniciosus* (*Bull. Dep. Landb. Suriname* 33, 1915) is recapitulated and supplemented by personal observations on various macro- and microscopical characters of specimens from Dutch and British Guiana.

The monograph is provided with keys for the determination of the species of *Crinipellis* and *Chaetocalathus*, lists of ambiguous species and of those to be excluded from the former genus, an index of (*a*) hosts, and (*b*) sections, subsections, species, subspecies, varieties, and forms of both genera, and a bibliography of 25 titles.

Van der Plank (J. E.) & Anderssen (E. E.). **Kromnek disease of Tobacco.** - *Fmg S. Afr.*, xix, 219, pp. 391–394, 2 figs., 1944.

In many parts of the Transvaal, the most damaging disease of tobacco is kromnek [tomato spotted wilt virus: *R.A.M.*, xix, p. 620], which appears every year in the Brits district and elsewhere. It is particularly troublesome among young plants, soon after transplanting, and is generally more prevalent early in the season than in crops planted later in summer.

Control is facilitated by the fact that the insect vectors [*Frankliniella schultzei* and ? *Thrips tabaci*: loc. cit.] remain more or less immobile on the tobacco plants. Infection appears to come invariably from some plant other than tobacco. The number of infective insects arriving in a field is not unlimited, and a good stand of plants can be saved by transplanting more than would be needed if all remained healthy. The excess plants are spares, which act as host to the infective insects which come into the field, and so safeguard the rest. In tests at Brits doubling the number of plants set out in a field has always resulted in a good stand of healthy

plants. When severe outbreaks occurred, double numbers saved the crop, while fields planted out in the normal way had to be ploughed under.

After transplanting thickly, the plants can be left for four to eight weeks and the excess plants then pulled up. Even when plants are large, close planting is of great value against the disease, and the best method of control is to maintain as many plants as possible per unit area at all stages of growth. Doubling the stand by planting in pairs with the same distance between each two pairs as normally exists between two single plants has the advantage that in thinning out one of the pair can be left and an even spacing maintained. Infection of both plants in a pair is very uncommon. In two seasons' tests at Brits with several varieties, the percentages of plants lost ranged from 2 to 26·1 (average 11·2) for the ordinary method of planting and from 0 to 2·9 (average 1·15) for planting in pairs.

Rawlins (T. E.). **Stream double refraction studies on the orientation of Tobacco mosaic virus particles.** *Science*, N.S., xcix, 2579, pp. 447–449, 1944.

A recent modification of technique for the study of tobacco mosaic virus particles led to a slight revision of some of the author's previous conclusions [*R.A.M.*, xii, p. 525]. The newly obtained evidence indicates that the flowing rod-shaped particles of this virus do not produce uniform bi-refringence throughout the width of the stream but show less in a narrow central portion of the stream than in the adjacent regions on each side of it. In the regions with the strongest bi-refringence the particles are not exactly parallel to the direction of flow but have their forward ends tilted towards the middle of the stream at an angle of approximately 15° to the direction of flow. This and further evidence (to be published at a later date) lead the author to conclude tentatively that there is a tri-dimensional orientation of tobacco mosaic virus particles.

Smith (T. E.). **Status of Tobacco blackshank in North Carolina.** *Plant Dis. Reptr*, xxviii, 4–5, p. 159, 1944. [Mimeographed.]

New strains of tobacco, Oxford 1, 2, 3, and 4, resistant to black shank (*Phytophthora parasitica* var. *nicotianae*) [*R.A.M.*, xxii, p. 411; xxiii, p. 318], were released for general use in North Carolina in 1943 with excellent results in spite of generally unfavourable seasonal conditions. Oxford 1 produced 800 lb. of tobacco per acre on one badly contaminated farm in Forsyth County where one of the regular varieties had yielded slightly less than 100 lb. the previous year. Although resistance to black shank was generally adequate, in some cases a loss of up to 20 per cent. of the plants occurred in beds or fields where tobacco had been badly diseased in 1942. The period of maximum loss in such fields was shortly after plants were set out, when they are apparently most susceptible, indicating the need for continued sanitary practices which would lessen the likelihood of infection during the early stages of growth. The best results both in quality of the crop and disease control were obtained on soil rested from tobacco for two or three years. The author is inclined to accept the view expressed by Vaughan (*Plant Dis. Reptr.* xxvii, pp. 643–645, 1943) that wind-borne inoculum may be responsible for the spread of black shank. In four new outbreaks in North Carolina the incidence of the disease could not be explained satisfactorily by the movement of infected plant material or contaminated soil. In 1941, leaf and stem lesions due to black shank infection were found abundantly in a few fields where soil-borne inoculum was present, but often occurred near the top of the plant, so that infection from spattered surface soil seemed unlikely. It is concluded that under favourable conditions black shank may spread by air for short distances. Granville wilt (*Bacterium* [*Xanthomonas*] *solanacearum*) is stated to be widespread in a part of the area attacked by black shank. The occurrence of both diseases in the same area presents

a serious problem, as none of the commercially usable strains combines resistance to both.

Smith (T. E.). **Control of bacterial wilt (Bacterium solanacearum) of Tobacco as influenced by crop rotation and chemical treatment of the soil.**—*Circ. U.S. Dep. Agric.* 692, 16 pp., 4 figs., 1 graph, 1944.

The results of investigations on the control of tobacco bacterial wilt (*Bacterium* [*Xanthomonas*] *solanacearum*), which have been in progress since 1935 at the North Carolina Agricultural Experiment Station [*R.A.M.*, xix, p. 123], showed that crop rotation (preferably triennial) afforded a measure of success, maize, soy-beans (formerly believed to be susceptible to the pathogen), and red top (*Agrostis alba*) being the most suitable forerunners of tobacco, especially the first-named. Under the exceptionally favourable conditions for the disease prevailing in 1939, these three crops were more effective than crabgrass (*Digitaria sanguinalis*), sweet potato, or native weeds. Tests of wilt-resistant tobacco strains in combination with crop rotation showed that an increase in the control of infection followed the cultivation of a slightly resistant line, e.g., Davis Special, on land rotated to maize for one year, but little or no benefit was obtained by the use of moderately resistant strains (T.I. 79 A and Zanthi) or even highly resistant ones (T.I. 448 A and 79 X) as an adjunct to rotation.

Soil treatment with urea at a rate supplying 420 lb. nitrogen per acre, in conjunction with a one-year maize rotation, resulted in the production of a normal crop of high-grade tobacco. The maximum benefit, especially from lower doses (105 or 210 lb. nitrogen per acre) of the compound, was secured by spring applications. In a total of nine replicates at five locations, commercial-grade urea (containing 42 per cent. nitrogen) was applied at dosages of 250, 500, and 1,000 lb. per acre in October, 1941 and March, 1942. Maize was grown in the latter year and tobacco in 1943. The maize grew vigorously on all the sites, the average yields for the three rates of urea (combined with 500 lb. 0–10–10 fertilizer per acre) being 27·1, 46·8, and 55·8 bush. per acre, respectively. The mean wilt percentages in the tobacco crop treated at the three rates were 63, 36·4, and 13, respectively; only the heaviest dosage was regarded as commercially adequate. The cost of 1,000 lb. urea required to treat one acre was $40, based on pre-war prices, which is considered economically sound in view of the increased maize yields and prevention of loss from wilt, which often exceeds $100 per acre. Chloropicrin also gave good control of wilt, but is too expensive and the technique of application too complicated for large-scale use.

Pollard (L. H.), Peterson (H. B.), Blood (H. L.), & Peay (W. E.). **Tomato production in Utah.**—*Circ. Utah agric. Exp. Sta.* 120, 31 pp., 16 figs., 1944.

In the section of this circular dealing with diseases of tomatoes in Utah, H. L. Blood gives descriptions with recommendations for the control of *Verticillium* [*V. albo-atrum*: *R.A.M.*, xxi, p. 542] and *Fusarium* [*F. bulbigenum* var. *lycopersici*: ibid., xxiii, p. 121] wilts, damping-off, fruit rots, bacterial canker [*Corynebacterium michiganense*: ibid., xxi, p. 353], curly top [ibid., xxii, p. 44], mosaic, and double virus streak, caused by a combination of the tomato mosaic and the so-called potato latent [potato X] viruses. Spotted wilt is stated not to be serious enough in Utah to warrant control measures against the thrips, sufficient protection being afforded by locating seed beds and fields away from home gardens or commercial plantings of perennial ornamentals. To control blossom-end rot, it is recommended to use a fertile soil and to maintain uniform moisture throughout the summer. Sunscald, a physiological disorder resulting from the exposure of green or partially ripened fruit to direct sunlight, is stated to be rather prevalent in Utah, being favoured by *Verticillium* wilt infection, improper application of irrigation water, and poor

cultural practices. In the mild form, it causes a yellow or whitish patch on the side of the fruit facing the sun; when more severe, it may form a large, flattened, greyish-white spot with a dry, papery surface. For the control of this disorder it is essential to control *Verticillium* wilt, to avoid excessive irrigation, and to refrain from all practices involving the cutting-away of much of the foliage and thus exposing the fruit to direct sun rays. A blossom drop frequently observed in Utah follows the failure of tomato plants to set a normal crop of fruit, resulting in reductions in yield. The condition is influenced by a number of environmental factors, such as low soil moisture accompanied by hot, drying winds, or spells of sudden cool weather and beating rains; excessive application of nitrogenous fertilizers may also be responsible for it. It is recommended to keep up the soil moisture during periods of hot dry weather, avoiding excessive application of water or of fertilizers with high nitrogen content.

ARK (P. A.). **Studies on bacterial canker of Tomato.**—*Phytopathology*, xxxiv, 4, pp. 394–400, 1944.

White, pink, and rough variants of tomato canker (*Phytomonas michiganensis*) [*Corynebacterium michiganense*] were studied at the University of California, Berkeley, in comparison with the normal strain in respect of their physiological and pathogenic characters [*R.A.M.*, xiii, p. 547]. They were found to differ slightly from the ordinary yellow strain in their reactions to sugars on culture media and to cause less damage to their host, the pink mutant in particular being relatively innocuous.

Inoculation experiments with *C. michiganense* gave positive results on *Cyphomandra betacea*, which developed a black discoloration of the fibrovascular system; *Solanum nigrum* var. *guineense* responded similarly, while *Nicotiana glutinosa* showed foliar chlorosis and wilting, occasionally accompanied by the formation of minute cankers. *Lycopersicon pimpinellifolium* proved to be only slightly susceptible, while tobacco remained immune. Higher percentages of infection were obtained by cutting off the tips of tomato seedlings with a contaminated knife (up to 100 per cent.) than by the needle-prick method of inoculation (4 per cent.). The knife cuts remained susceptible to invasion for 72 hours. Infection may also be conveyed from diseased to healthy plants by handling in the course of transplanting operations. Uninjured plants did not develop the disease when sprayed with a heavy suspension of the pathogen and incubated in a moist chamber. Transmission tests with five species of insects gave negative results.

Corynebacterium michiganense was killed by aqueous solutions of brilliant green and malachite green (1 in 1,000) in five minutes, comparable effects being produced by rosaniline hydrochloride at the same strength in one hour. The addition of 5 (but not of 30) per cent. alcohol to the dyes retarded their bactericidal action, the periods then required by malachite green, brilliant green, and rosaniline hydrochloride to destroy the organism being 10 to 15 minutes and 24 hours, respectively. The germinability of tomato seed was not impaired by 24 hours' immersion in aqueous solutions of the dyes or by upwards of one hour in the same with the addition of alcohol. The maximum percentage of infection in plants grown from treated seed was 4·3 per cent. (1 in 1,000 malachite green in water only) compared with 26 in the untreated controls.

Dry heat did not injure Santa Clara Canner tomato seeds exposed to sufficiently high temperatures to kill *C. michiganense*. Dry (two-year-old) seeds can withstand air temperatures up to 85° C. for 15 hours, but this treatment caused a reduction of germination down to 40 per cent.

BUCHHOLTZ (W. F.). **Tomato leaf spot diseases in South Dakota.**—*Circ. S. Dak. agric. Ext. Serv.* 408, 7 pp., 2 figs. (1 col.), 1 map, 1944.

This popular booklet on tomato leaf spot diseases in South Dakota gives the

following recommendations for their control. *Septoria* [*lycopersici*: *R.A.M.*, xxiii, p. 82] can be controlled by measures directed against the overwintering source of infection, such as burning or thorough ploughing-under of all plant remains, and crop rotation; by measures ensuring rapid drying of the foliage after rain, such as the choice of open, airy locations and the trimming and staking of plants; by avoiding walking or working among the plants when the leaves are wet; and by spraying with Bordeaux mixture at 10-day intervals beginning soon after the first fruits are set. All the above-mentioned measures are applicable for the control of *Alternaria* [*solani*: ibid., xxiii, p. 318] also, and in addition, seed treatment with mercury or copper dusts and growing seedlings in soil not previously cropped to tomatoes are recommended.

Miller (P. A.) & Roewekamp (F. W.). **Environmental factors in relation to tree decline.**—*Trees*, vi, 1, pp. 9–11, 4 figs., 1 graph, 1 map, 1943.

During 1941, sudden decline and death of many large roadside trees occurred in the San Fernando Valley, California. Of the 217 trees found severely affected or killed, 198 were deodar cedars (*Cedrus deodara*), 15 magnolias (*Magnolia grandiflora*), two Monterey pines (*Pinus radiata*), and two acacias (*Acacia decurrens* and *A. melanoxylon*), while trees of *Casuarina stricta* and *Sterculia diversifolia*, though interplanted with diseased trees of other species, showed no apparent injury, and *Phoenix canariensis*, Washington [*Washingtonia filifera*], and *Trachycarpus fortunei* palms exhibited only very slight symptoms. The features of decline or collapse are stated to vary with the extent to which the functional root system of a tree has been impaired or destroyed, but they may not appear until some time after this root injury has occurred. Examination of the root systems of collapsed trees showed that all the main and lateral roots below the 3 or 4 ft. level were rotten and decomposed. Environmental factors contributing to the occurrence of decline in the area are heavy rainfall, heavy soils, poor drainage, waterlogging and consequent lack of aeration of the soil in the root zone, and the presence of toxic materials in the soil. An analysis of water samples from holes revealed a specific electrical conductance and boron and nitrite concentrations far in excess of those considered as injurious to most plants.

Murrill (W. A.). **Fungous diseases of Florida forest trees.**—*Plant Dis. Reptr*, xxviii, 3, pp. 103–112, 1944. [Mimeographed.]

This list of fungous diseases of wild native trees in Florida is arranged under four headings: leaf diseases, trunk and branch diseases, root diseases, and rust diseases. Each group is introduced by a short general note, and the fungi listed alphabetically with the common name of the host, an index of scientific names of the hosts being appended.

Ark (P. A.). **Pollen as a source of Walnut bacterial blight infection.**—*Phytopathology*, xxxiv, 3, pp. 329–334, 3 figs., 1944.

The few cankers in evidence in a recent epidemic of walnut bacterial blight (*Phytomonas* [*Xanthomonas*] *juglandis*) in California led to an inspection of dormant catkin and leaf buds and the pollen of diseased catkins, all of which were found to be contaminated [*R.A.M.*, i, p. 397]. In a series of tests in 1942–3, 16 per cent. of the catkins collected on 20th August, 1942, yielded virulent living cultures of the bacterium, the corresponding figures for 15th September, 16th October, 12th November, 23rd December, 18th January, and 20th February, being 20, 15, 30, 26, 18, and 27, respectively. Of the blighted leaf buds on the same trees, 10 to 26 per cent. contained living organisms in cultures made at monthly intervals from August to February. In the spring of 1943, numerous colonies of *X. juglandis* developed on nutrient agar plates on which the pollen from diseased catkins was

shaken in the field, and the pathogenicity of the cultures was established by inoculations on immature nuts in May and June. Other experiments demonstrated the possibility of blight dissemination by a mixture of diseased and healthy pollen, such as would occur in nature in partially diseased catkins. *X. juglandis* makes profuse growth on agar jelly with no other nutrient than walnut pollen, from which it was recovered after four months' storage.

MILLER (P. W.). **Further investigations on the war-time control of Walnut blight and Filbert blight.**—*Proc. Ore. St. hort. Soc.*, xxxv (*1943*), pp. 103–106, 1944.

In further work on the control of walnut blight (*Xanthomonas juglandis*) [*R.A.M.*, xxii, p. 411] in Oregon, attempts to find a satisfactory substitute for Bordeaux mixture were continued. Under the conditions prevailing in 1943, thiosan and fermate were ineffective. Additional evidence was obtained that Bordeaux mixture (4–2–100) gives almost as good control in an average season as stronger concentrations, if the applications are made thoroughly. In tests near Scholls, two applications at 4–2–100 reduced infection from 33·4 to 2·3 per cent., while two applications at a concentration of 6–2–100 reduced it to 1·9 per cent. Similar results followed a reduction in the concentration of yellow cuprous oxide from 1½ lb. in 100 gals. water to 1 lb., two applications at the lower strength reducing infection from 33·4 to 6·5 per cent., and at the higher to 5·5 per cent. In tests with fixed copper compounds containing comparatively small amounts of metallic copper, two applications of zinc-copper ammonium silicate (4–100), copper oxalate (2–100), and tribasic copper sulphate (2–100) reduced infection from 43·9 per cent. to 4·3, 5·4, and 6·5 per cent., respectively. Two applications of Bordeaux mixture (4–2–100) reduced infection to 5·9 per cent. In dusting trials, two applications of a 25 per cent. copper-lime dust at late pre-bloom and early post-bloom reduced infection from 57·4 to 16·7 per cent., two applications of Bordeaux mixture at approximately the same times reducing infection in a neighbouring orchard to 8·6 per cent. The evidence indicated that three to five dustings are necessary to ensure satisfactory control. This entails the use of more metallic copper than does spraying, but dusting may be resorted to as an emergency measure.

Further tests confirmed the results obtained in earlier work on the control of filbert [*Corylus avellana*] blight (*Phytomonas corylina*) [ibid., xxi, p. 310], again showing that prompt spraying with Bordeaux mixture materially reduces bud and twig blight. In one test, one application of Bordeaux mixture reduced bud and twig blight incidence from 3·6 to 0·3 per cent. Current studies indicate that Bordeaux mixture (6–2–100) is as effective as 8–4–100. To secure adequate control of twig blight a film of spray must uniformly coat the buds in the axils of the leaves. A good spreader and sticking agent must be used, a special effort made to spray thoroughly, and before the first rain. If rainfall is abnormally heavy in autumn, winter, and early spring, supplementary applications may be required in late autumn when about three-quarters of the leaves have fallen, and again in early spring, just after the leaf buds open.

Service and regulatory announcements, October–December, 1943. Plant-quarantine import restrictions, Republic of Mexico.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, p. 42, 1944.

Exterior quarantine No. 7 prohibits the entry into, or passage through, the Republic of Mexico of all species of banana plants or parts thereof, including fruits, from any foreign country, on account of the risk of introduction of Panama disease (*Fusarium* [*oxysporum* var.] *cubense*) or leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*]. Exempt from this regulation (under certain prescribed conditions and subject to permission by the Director-General of Agriculture) are consignments of bananas from Guatemala.